

**A VEGETATION SURVEY OF EFFIGY MOUNDS  
NATIONAL MONUMENT**

**Evelyn A. Howell, Associate Professor  
Department of Landscape Architecture  
University of Wisconsin  
Madison, Wisconsin 53706**

**Darrel G. Morrison, Dean  
School of Environmental Design  
The University of Georgia  
Athens, Georgia 30602**

**Gregory F. Moore, Research Assistant  
Department of Landscape Architecture  
University of Wisconsin  
Madison, Wisconsin 53706**

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## Abstract

Seven major plant communities at Effigy Mounds National Monument were mapped and sampled using qualitative and quantitative techniques. The communities were identified as follows: 1. Sny McGill Bottomlands (wet-mesic forest), 2. North Unit Oak-Maple Woods: North End (dry-mesic forest), 3. North Unit Oak-Maple Woods: South End (dry-mesic forest), 4. South Unit Oak-Maple Woods (dry-mesic forest), 5. South Unit Prairie Remnant, 6. North Unit Old Field, and 7. North Unit Aspen Woods (dry-mesic forest). The woodland communities were considered to be of good natural quality. They are diverse with few obvious signs of recent human disturbance. Nine relatively rare herbaceous species of concern to Iowa were found in the wooded areas. The two open communities are dominated by Eurasian grasses with pockets of native prairie species. Neither area can be considered representative of a good quality native community.

Management recommendations for the woodland areas include no active intervention in natural processes in the near future given a continuation of current use-levels. With time the upland areas are expected to become more mesic and more similar to one another; the lowland area is expected to remain essentially as it is now. The only exception to this hands-off policy would be to cut portions of the Aspen Woods if continued or greater community diversity is desired. Prairie restorations are suggested for at least some portions of the open areas. Three approaches are recommended for managing the vegetation on the mounds: 1. mown lawn, 2. cover of Antennaria neglecta (pussy toes), and 3. woodland understory.

It is suggested that the plant communities be re-surveyed on a regular basis. Of particular importance are long-term population studies of the rare woodland species.

## 1. General Introduction

The intent of this project was two-fold: 1. To document the current vegetation of Effigy Mounds National Monument, and 2. To provide vegetation management recommendations for the site paying particular attention to the effigy mounds themselves. Our procedure was as follows:

- 1) Identify the vegetation management goals for the site.
- 2) Describe and analyze the existing plant communities.
- 3) Describe the early (presettlement) vegetation of the site.
- 4) Provide management recommendations such that the vegetation will serve the site goals.

The body of the report is divided into four sections. The first, "Analysis and Description of Current Vegetation," describes the procedures and results of our qualitative and quantitative plant community surveys which took place in late summer and fall, 1982, and spring, summer and fall, 1983. The second section, "Preparation of Maps" summarizes the sources used in making the mylar overlays which accompany the report. This is followed by a discussion of the "Early Vegetation of the Monument". The fourth and final section concerns our "Management Recommendations."

Several people were involved in various phases of the project. Martha Makholm made initial site visits and compiled information on the mound building culture and on the Monument. Karene Motivans reviewed and helped edit the report. Barbara Moore, John Harrington and Gretel Hengst assisted with various phases of the field work. Diane Peck assisted with the field work and drafted the maps of the site. Greg Moore was the primary field researcher for the project. He also summarized the sampling data, participated in the vegetation analysis, and helped devise management strategies. Darrel Morrison made several site visits, assisted with some of

the sampling, and worked on management recommendations for the effigy mounds and the open areas of the site. Evelyn Howell participated in some of the field work, provided the majority of the vegetation analysis and management recommendations, and was the principal author of this report.

## 2. Analysis and Description of Current Vegetation

### A. Introduction

In order to provide vegetation management recommendations for the Monument, we need to ask the following questions with regard to the current vegetation:

- 1) What are the major plant communities at the site?
- 2) What is the natural quality of each?
- 3) In what ways (if any) will the communities change in the future if no active management takes place, and how fast are such changes likely to occur?

In order to address these questions, it is important to have an ecological framework to use as a model. The model helps guide our decisions about what kinds of vegetation information to gather and what sampling methods to use, and also provides a standard for quality judgements and a basis for making predictions about the future.

We chose the approach used by John T. Curtis (1959) in the Vegetation of Wisconsin for our model. Curtis provides analyses and descriptions of the major plant communities in Wisconsin, based on quantitative samples of over 1400 apparently undisturbed stands (at least in terms of the major impacts of European civilization--grazing and logging) and on examinations of the presettlement United States Government Land Survey. His work includes predictions of successional trends and discussions of relationships between

communities as well as statistical tabulations of data which can be used to characterize natural quality.

Although differences between the regions do occur, because of the physical and environmental similarities between Northeastern Iowa and Southwestern Wisconsin, Curtis' study provides applicable information. The vegetation sampling and analysis methods described below were chosen for their similarities to the methods used by Curtis in order to be able to make maximum use of his study.

#### B. Sampling Methods

During the late summer and fall of 1982, we conducted several walk-through surveys of the site in order to identify the major plant communities of the Monument. We compared our field observations with recent aerial photographs and with existing vegetation and topographic maps in order to locate units of vegetation which are relatively homogeneous in terms of the presence, abundance, and size of their visually dominant species. We then classified the communities according to their dominant life-forms (trees, grasses, etc.).

After our initial community designations, we re-surveyed each area in fall, 1982 in order to provide preliminary species lists. In addition to noting the presence of each species, we recorded its perceived relative abundance. If a species was encountered frequently within a community, it was considered to be "Common". All other species were then categorized relative to the common species. Those encountered only infrequently or in a limited micro-habitat, such as on the faces of moist, shady limestone outcrops (e.g., Camptosorus rhizophyllus (walking fern)) were categorized as "Rare at Site". Species encountered less frequently than those considered "Common" but more frequently than those considered "Rare" were classified as being of

"Intermediate Abundance". We repeated the walk-through survey in the spring of 1983, primarily in the wooded portions of the North Unit, in order to add spring ephemerals to our lists.

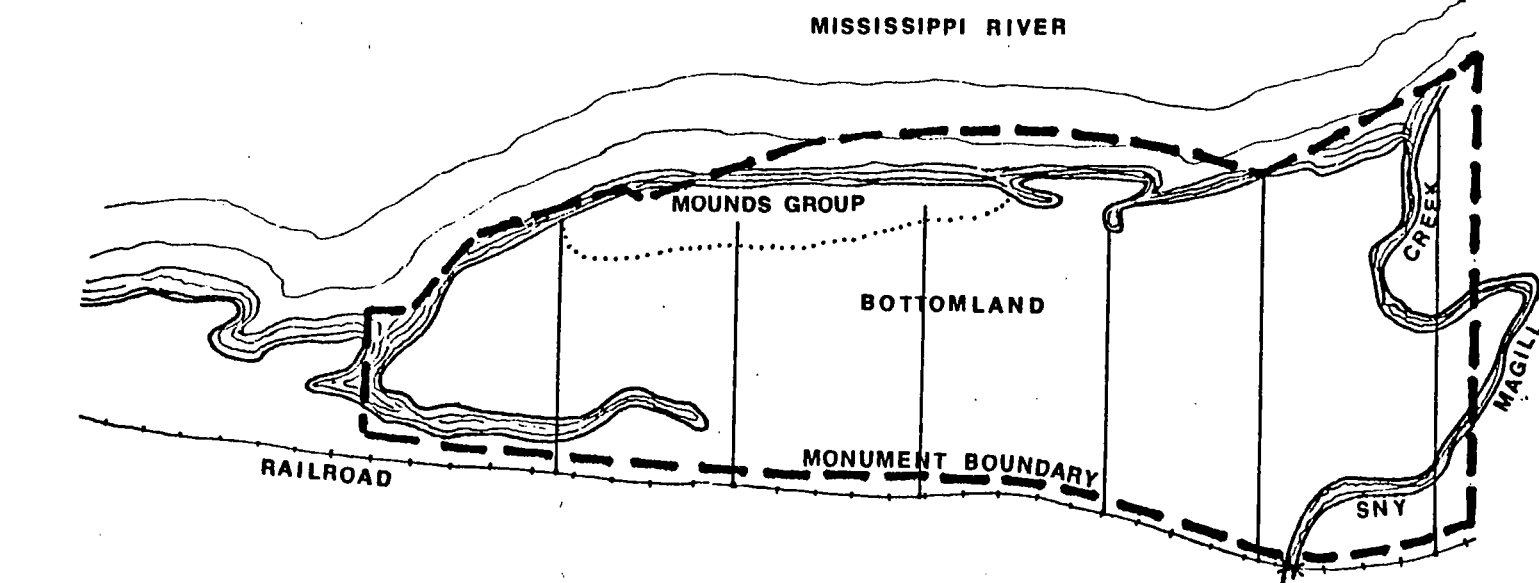
During the summer and fall of 1983, we conducted a systematic, quantitative sample of each of the seven major vegetation units of the Monument as determined by our initial community classification: Area 1--Sny Magill Bottomlands; Area 2--North Unit Oak-Maple Woods: North End; Area 3--North Unit Oak-Maple Woods: South End; Area 4--South Unit Oak-Maple Woods; Area 5--South Unit Prairie Remnant; Area 6--North Unit Old Field; and Area 7--North Unit Aspen Woods. The general locations of these communities are indicated in Figures 1-3. Table 1 indicates the beginning and end of the sampling period for each area. Our species nomenclature follows that of the Manual of Vascular Plants of Northeastern United States and Adjacent Canada (Gleason and Cronquist, 1963) and/or The Plants of the Chicago Region (Swink and Wilhelm, 1979). Species were primarily identified in the field, however we brought questionable specimens to the University of Wisconsin Herbarium to be checked against their collection and/or verified by curator Theodore S. Cochrane or Director, Hugh H. Iltis.

For Areas 1,2,3, and 4, we established permanent sampling stations marked with metal stakes, painted orange and driven into the ground. Thirty points were established in each area (31 in Area 4) at predetermined locations along east-west transects spaced so as to give maximum coverage of the whole community. We assigned a three-digit number to each sampling station. The first digit represents the sampling area, the second the transect number,

**Figure 1**

**Preliminary Map of Plant Communities**

**Sny Magill Mounds Area**

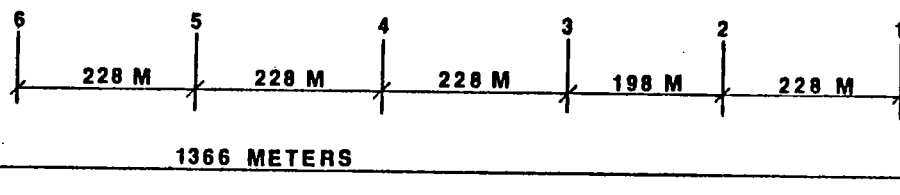


AREA NUMBER 1 - ALL TRANSECTS

TRANSECT IDENTIFICATION NUMBER

DISTANCE BETWEEN TRANSECTS

BASELINE LENGTH

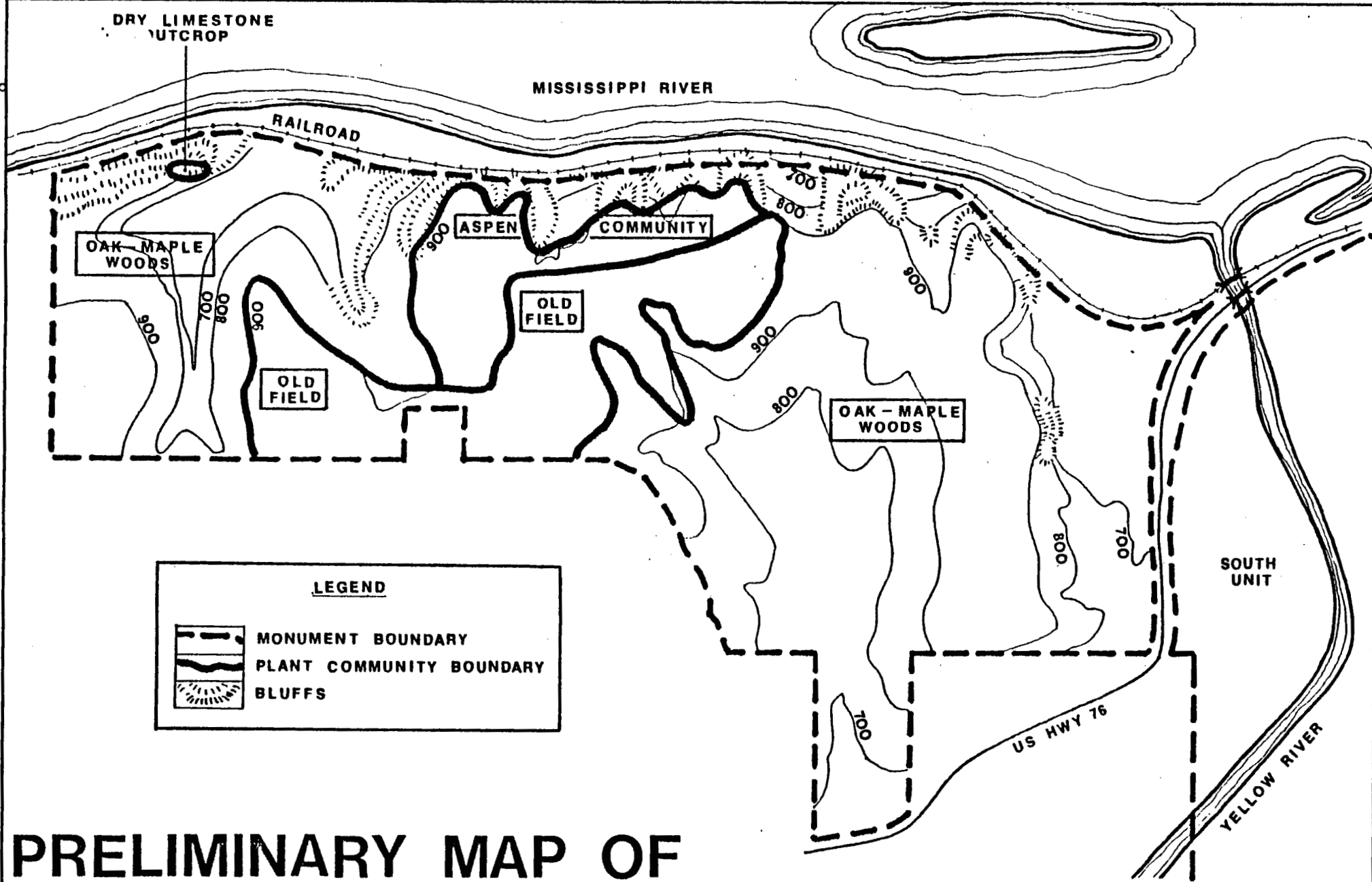


# PRELIMINARY MAP OF PLANT COMMUNITIES

SNY MAGILL MOUNDS AREA  
EFFIGY MOUNDS NATIONAL MONUMENT

**Figure 2**

**Preliminary Map of Plant Communities  
North Unit**



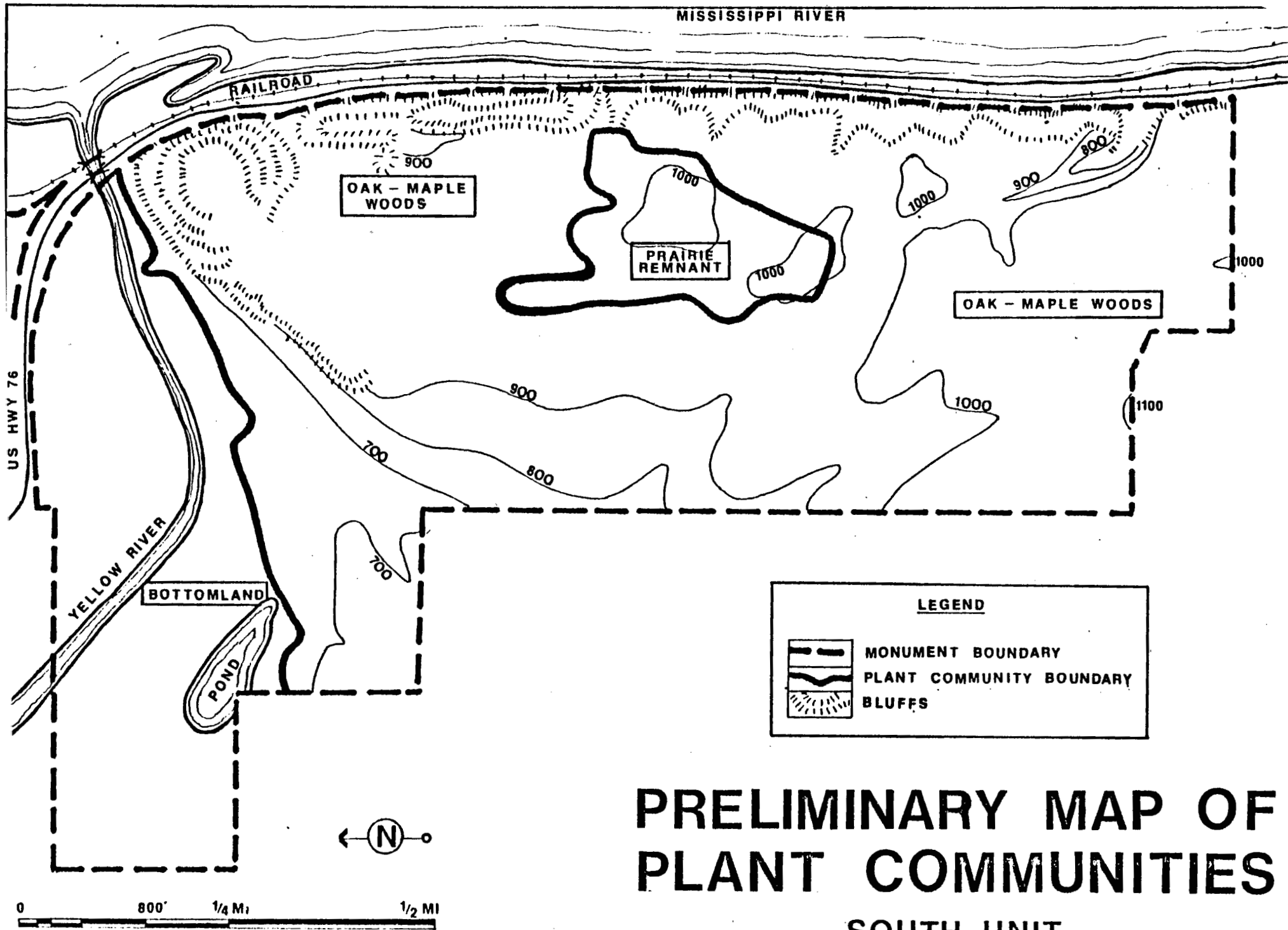
# PRELIMINARY MAP OF PLANT COMMUNITIES

NORTH UNIT  
EFFIGY MOUNDS NATIONAL MONUMENT

**Figure 3**

**Preliminary Map of Plant Communities**

**South Unit**



# PRELIMINARY MAP OF PLANT COMMUNITIES

SOUTH UNIT  
EFFIGY MOUNDS NATIONAL MONUMENT

Table 1  
Plant Community Sampling Dates  
1983

Vegetation Unit	Beginning Date	Ending Date
Area 1 Sny Magill Bottomlands	October 25	October 26
Area 2 North Unit Oak-Maple Woods: North End	July 25	August 2
Area 3 North Unit Oak-Maple Woods: South End	June 1	June 21
Area 4 South Unit Oak-Maple Woods	July 6	July 14
Area 5 South Unit Prairie Remnant	August 11	August 17
Area 6 North Unit Old Field	August 31	September 1
Area 7 North Unit Aspen Woods	September 7	September 11

and the third the point number. Thus, for example, point 4 on transect 1 in Area 3 is identified with the number 3-1-4. We tagged each metal stake with the appropriate number and also marked the trunk of the nearest large tree using orange spray paint in order to make it easier to relocate the points.

At each sampling station we noted the presence and basal area of all trees (woody plants with stems  $\geq 0.8\text{dm}^2$  basal area) within a  $100.0\text{m}^2$  circular quadrat and of all saplings (tree species with stems  $< 0.8\text{dm}^2$  but tall enough to be measured at breast height ( $\approx 1.3\text{m}$ )) in a  $10.0\text{m}^2$  circular quadrat. Excluding Area 1, we also counted the stems of seedlings, herbs, vines, and shrubs within a  $1.0\text{m}^2$  square quadrat.

In addition to the quadrat samples we measured shrub cover with the line intercept method using a  $30.0\text{m}$  tape. We centered the tape on the sampling point and extended it on a north-south line perpendicular to our east-west transects. The percentage of the line covered by shrubs was recorded by species.

We also recorded the cover of vine species on some of our shrub intercept lines. In Area 3 we measured vine cover at all thirty sampling points; in the other wooded communities we noted vines for five of the intercept lines.

Area 7, an aspen community, was sampled in a similar fashion. Because of the small size of the site, however, we established only fifteen sampling points, and did not make them permanent.

Our initial 1982 survey identified two relatively large open communities (Areas 5 and 6). We located fifty non-permanent sampling points in each area which were regularly-spaced along east-west transects. At each of the points we noted the presence of all species within a  $0.25\text{m}^2$  square quadrat.

## C. Vegetation Analysis Procedures

### 1. Data Summaries

#### a. Woodland Communities

Saplings and Trees: We calculated an Importance Value (I.V.) (Curtis, 1959) for each tree species in our sample of a community and then used these figures together with Continuum Adaptation Values (Curtis, 1959) to classify the community type. Importance Values are calculated from relativized values of frequency, density, and dominance (total basal area):

$$\text{Importance Value (trees, saplings)} = (\text{Relative Density} + \text{Relative Frequency} + \text{Relative Dominance})/3.$$

These figures as well as raw density and frequency figures can be useful in understanding a community as well as in classifying it. Density values indicate the population size of an individual species; frequencies provide an estimate of how widespread a species is within the community. Importance Values measure the relative influence of species within a community by combining the contributions of density, frequency, and the size of the stems (dominance). We provided similar summaries for the saplings in the community. We also created species/size class graphs to help predict the future composition of each area.

Herbs, Seedlings, Vines and Shrubs: We determined density and frequency for each species and combined relativized values of these to determine the relative importance of each within the community: Importance Value (herbs, seedlings, vines, shrubs) = (Relative Density + Relative Frequency)/2. The function of this Importance Value is similar to that described above for trees and saplings. It differs in that there is no measure comparable to dominance.

Shrubs, vines: We determined the percent cover for each species within each community.

Overall: We calculated figures such as total tree density, average tree size, and total species number for each community. We also determined whether each species is native or exotic (Swink and Wilhelm, 1979), which species are listed as prevalent or modal species by Curtis (1959), and which are found in a preliminary list of vascular plants of rare or uncertain status in Iowa (Pusateri, 1982). The presence of exotic species is an indication of human impact, and therefore an indicator of community quality. In general, the more exotics a community has, the lower its natural quality. Prevalent species are those identified by Curtis as being the most likely to be encountered in a given stand of a community, and can be used to determine how "representative" an area is. Modal species for a particular community are those which reach their highest presence there. That is, they are found in more examples of that community type than of any other. The presence of rare or endangered species in a community has implications for its future management as many incentives exist to maximize the survival of such species. The list prepared by Pusateri (1982) was the only local ranking of rarity that we could obtain.

b. Open Communities

We calculated species frequencies and noted each species as native or exotic (Swink and Wilhelm, 1979).

## 2. Spatial Analysis of Sampling Points

We initially determined the boundaries of the major plant communities of the Monument by visual inspection of species homogeneity. By examining the species found together in each quadrat and by noting the spatial relationships between the quadrats, we further divided the communities into subunits characterized by different species complexes.

## 3. Field Notes

During our visits to the Monument, in addition to undertaking systematic samplings of the communities, we took notes of our general impressions of the area. These notes, as well as the initial qualitative sample of each site, form the basis for a series of "subjective impressions." Although perhaps not so reliable as the information gained by the quantitative sample, these impressions are useful in describing the vegetation.

## D. Plant Community Descriptions and Analyses

### 1. Introduction

The original vegetation of the upland portion of the Effigy Mounds area was mesic forest dominated by maples and basswood with scattered prairie openings located on the south-facing hillsides and rocky bluffs (see Section 4). The current vegetation of the Monument still follows this trend with the majority of the area being forested and either already dominated by mesic species (Area 3, Area 4) and/or containing sapling species (especially sugar maple) which indicate that mesic forest communities will dominate in the future (Areas 2, 3, 4, 7). The major openings on the site at present (Areas 5 and 6) are remnants of farming activities. They are dominated by Eurasian grasses with pockets of native prairie species. Portions of both sites contain concentrations of shrubs, saplings, and small trees, suggesting that

the open character may be lost with time. Small prairie areas still exist along bluff edges, though they too suffer from shrub invasion. The Sny Magill bottomlands is currently a floodplain forest and, barring major changes in the river systems is likely to retain its main characteristics in future.

As indicated previously, the current vegetation of Effigy Mounds Monument is divided into seven major communities. Each of these will be discussed in the following format, starting with the woodland communities and continuing with the open areas:

- a) General Description (based on field notes)
- b) Description of Community Subunits
- c) Discussion of Field Data
- d) Community Analysis: Description of Quality and Probable Future.

The discussion will end with an overall analysis of the Mounds vegetation as it is at present.

## 2. Area 1: Sny Magill Bottomlands (Figures 4 and 5; Tables 2, 3, 4, and 5)

### a. General Description

The Sny Magill Bottomlands is dominated by silver maple (Acer saccharinum) and American Elm (Ulmus americana) and has an open, park-like, largely herbaceous understory. Many of the understory species occur in extensive patches. This area proved to be one of our greatest sampling challenges. Situated on relatively flat land with large, widely-spaced trees and few shrubs and saplings to hinder passage, it would appear to be easily accessible. However the combination of prolonged spring flooding and the presence of head-high nettles (Laportea canadensis) from summer into fall prevented us from completing our data collection for this area. We were able, however, to collect enough information to provide a reasonable vegetation analysis.

Although topographic variations are relatively small in the bottomlands compared with the range of elevations present in other portions of the Monument, we were able to detect differences that also seem to be reflected in the vegetation. The eastern edge of the site, the bank of Johnson's Slough, is higher and drier than the remaining area and has concentrations of Carya cordiformis (bitternut hickory) and Quercus bicolor (Swamp White Oak). The understory in this portion of the site is dense with tangles of gooseberry (Ribes sp.) and poison ivy (Rhus radicans). This is also the only part of Sny Magill where we observed Tilia americana (basswood).

The southern edge of Sny Magill is somewhat higher than the north end, though not so high as the slough bank. It contains several very large (basal area approximately 100 dm<sup>2</sup>) standing dead silver maple trees. Reproduction under these is good, characterized mostly by elm and ash (Fraxinus sp.). An almost solid stand of nettles dominated the groundlayer at the time of our sample. Their presence is an indication that water levels fluctuate greatly in this area.

The north end was partially inundated in late October, 1983 (the south end was dry at this time). There were no nettles. One small portion of this area appears to be wet for most of the year. It is surrounded by Salix interior (sandbar willow) and cutgrass (Leersia sp.).

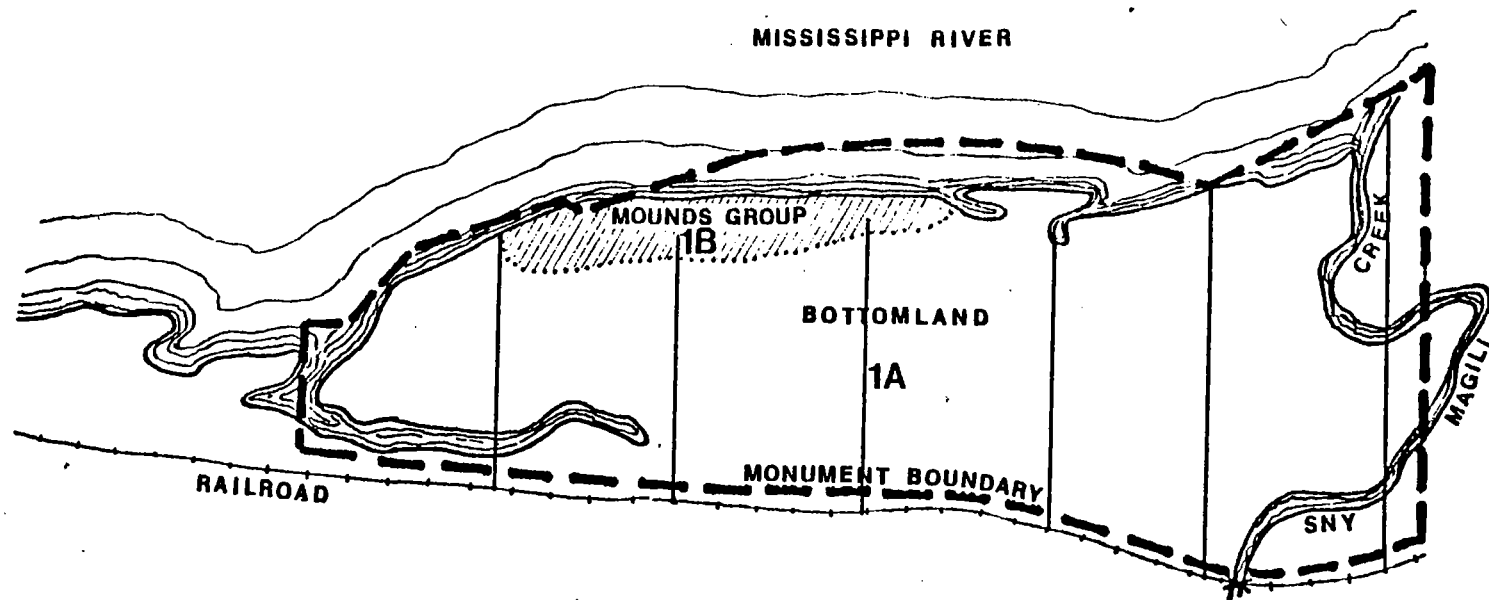
#### b. Description of Community Subunits

A spatial analysis of our quantitative sampling data indicates that Sny Magill consists of two subunits. As indicated in Figure 4, the majority of the site--the area labeled 1A--is dominated by silver maple and American elm. The eastern edge of the site, near the Mounds Group, has a distinctly different tree layer. Area 1B is dominated by Carya cordiformis,

**Figure 4**

**Preliminary Map of Plant Communities**

**Sny Magil Subunits**



AREA NUMBER 1 - ALL TRANSECTS

TRANSECT IDENTIFICATION NUMBER

DISTANCE BETWEEN TRANSECTS

BASELINE LENGTH



1366 METERS



SCALE IN FEET



SUBAREA KEY SEE REPORT FOR PREVALENT TREE SPECIES IN A AND B

# PRELIMINARY MAP OF PLANT COMMUNITIES

SNY MAGILL MOUNDS AREA  
EFFIGY MOUNDS NATIONAL MONUMENT

Quercus bicolor, Celtis occidentalis (hackberry), and Fraxinus nigra (black ash).

### c. Discussion of Field Data

Three sets of field data are available for Sny Magill: 1. A quadrat sample of trees, 2. A quadrat sample of saplings, and 3. A species presence list based on a walk-through survey. Table 2 provides an overall summary of the quadrat data for this area as well as for the other wooded sites. As can be seen from this table, Sny Magill had 12 woody species (trees and saplings) in the sample with an overall tree density of 400 stems per hectare. It is classified as a wet-mesic forest using the continuum index established by Curtis (1959).

A detailed analysis of the tree data is presented in Table 3. Silver maple had the highest Importance Value (IV = 38.9) of any species with American elm a distant second at 20.7. These species together with green ash (Fraxinus pennsylvanica var. lanceolata) accounted for two-thirds of the trees (80 of 120) and 79.5% of the basal area (556.5 dm<sup>2</sup> out of 700.0 dm<sup>2</sup>). Silver maple and elm were widespread, each occurring in 15 of the 30 quadrats (50.0% frequency). Both of these species were found in large numbers--40 silver maples and 30 elms appeared in the sample. Silver maples had by far the largest basal area total with many individual trees reaching over 20.0 dm<sup>2</sup>. Other relatively important trees in our sample included swamp white oak (I.V. = 7.8) and black ash (I.V. = 6.1).

The sapling data are summarized in Table 4. Only 28 stems occurred in our quadrats, representing seven species. Of these, black ash and elm were the most numerous, followed by bitternut hickory. All other species were represented by only one individual. As indicated in our general description of the area, the saplings tended to be found mainly on the elevated portions

Table 2  
Summary of Sample of Forest Communities

	Area 1	Area 2	Area 3	Area 4	Area 7
Number of tree species	11	12	13	13	14
Number of sapling species	7	11	7	13	13
Number of seedling species	Not sampled	16	11	13	6
Number of shrub species	Not sampled	9	5	7	5
Number of vine species	Not sampled	3	1	4	2
Number of herb species	Not sampled	42	40	44	31
Total number of species	12 (Trees and saplings only)	74	63	72	56
Trees per hectare	400	457	407	371	467
Basal area per hectare	2333 dm <sup>2</sup>	2661 dm <sup>2</sup>	2582 dm <sup>2</sup>	2635 dm <sup>2</sup>	2567 dm <sup>2</sup>
Average basal area per tree	5.8 dm <sup>2</sup>	5.8 dm <sup>2</sup>	6.3 dm <sup>2</sup>	7.1 dm <sup>2</sup>	5.5 dm <sup>2</sup>
Continuum index	463	591	713	616	543
Community classification	Wet-Mesic Forest	Dry-Mesic Forest	Dry-Mesic Forest	Dry-Mesic Forest	Dry-Mesic Forest

Table 3  
Tree Data Summary  
Area 1 (Sny-MaGill Bottomlands)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importanc Value
<u>Acer negundo</u> (Box Elder)	1	2	7.0	1.8	1.7	1.0	1.5
<u>Acer saccharinum</u> (Silver Maple)	15	40	400.6	26.3	33.3	57.2	38.9
<u>Betula nigra</u> (River Birch)	1	1	0.8	1.8	0.8	0.1	0.9
<u>Carya cordiformis</u> (Bitternut Hickory)	2	3	6.8	3.5	2.5	1.0	2.3
<u>Celtis occidentalis</u> (Hackberry)	4	5	7.6	7.0	4.2	1.1	4.1
<u>Fraxinus nigra</u> (Black Ash)	2	10	46.1	3.5	8.3	6.6	6.1
<u>Fraxinus pennsylvanica</u> var. <u>lanceolata</u> (Green Ash)	8	10	80.1	14.0	8.3	11.4	11.2
<u>Gleditsia triacanthos</u> (Honey Locust)	4	4	31.0	7.0	3.3	4.4	4.9
<u>Populus deltoides</u> (Cottonwood)	1	1	11.5	1.8	0.8	1.6	1.4
<u>Quercus bicolor</u> (Swamp White Oak)	4	14	32.7	7.0	11.7	4.7	7.8
<u>Ulmus americana</u> (American Elm)	15	30	75.8	26.3	25.0	10.8	20.7
Totals	57	120	700.0	100	99.9	99.9	99.8

Table 4  
Sapling Data Summary  
Area 1 (Sny-MaGill Bottomlands)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importanc Value
<u>Betula nigra</u> (River Birch)	1	1	0.159	6.7	3.6	2.8	4.4
<u>Carya cordiformis</u> (Bitternut Hickory)	3	4	0.843	20.0	14.3	14.7	16.3
<u>Fraxinus nigra</u> (Black Ash)	3	13	3.287	20.0	46.4	57.4	41.3
<u>Fraxinus pennsylvanica</u> var. <u>lanceolata</u> (Green Ash)	1	1	0.053	6.7	3.6	0.9	3.7
<u>Gleditsia triacanthos</u> (Honey Locust)	1	1	0.454	6.7	3.6	7.9	6.1
<u>Ulmus americana</u> (American m)	5	7	0.899	33.3	25.0	15.7	24.7
<u>Salix interior</u> (Sandbar Willow)	1	1	0.028	6.7	3.6	0.5	3.6
Totals	15	28	5.723	100.1	100.1	99.9	100.1

of the site and were not particularly widespread. The quadrat data confirm this observation. The highest frequency value for any species was that of elm--16.7% (found in 5 of 30 quadrats).

The walk-through survey done October 10, 1982 presents our only information about the groundlayer at Sny Magill. As indicated in Table 5, we noted 30 groundlayer species of which 13 were common, 9 had an intermediate abundance, and 8 were relatively rare. The list includes herbs, shrubs, and vines. Two (possibly three) of the species are exotics: Leonurus cardiaca (Motherwort), Fagopyrum esculentum (buckwheat), and Echinochloa crusgalli (barnyard grass) (this may be European but Swink and Wilhelm (1979) claim there is a native strain). Curtis (1959) lists seven of the species as prevalents and eight are modal in Wisconsin lowland forests. A variety of one of the species, Teucrium canadense var. virginicum, is listed by Pusateri (1982) as being of undetermined status in Iowa. Pusateri also lists Decodon verticillatus (swamp loosestrife) as being threatened throughout its range or critically endangered in Iowa. This species was found in abundance at Sny Magill.

#### d. Community Analysis

Sny Magill Bottomlands is a good example of a wet-mesic floodplain forest. The dominance of silver maple, elm and green ash, the low number of saplings, the large individual trees, and the extensive patchy groundlayer of this area are characteristic of the stands described by Curtis (1959). The species list does contain a few exotics in the groundlayer (at least 6.7% (2) and possibly 10% (3) of the total number of species), but these are not likely to pose a threat to the natives. The remaining species are typical of a floodplain community, and although prevalent and modal species make up a relatively small proportion of the list (prevalents: 23.3%; modal

Table 5  
Species Presence List  
Sny Magill Bottomlands  
10 October 1982

Trees (8 Species)

Common at Site:

Acer saccharinum

Silver Maple

Intermediate Abundance:

Fraxinus pennsylvanica var. lanceolata

Green Ash

Populus deltoides

Cottonwood

Salix sp.

Willow

Ulmus americana

American Elm

Rare at Site:

Carya ovata

Shagbark Hickory

Robinia pseudoacacia

Black Locust

Tilia americana

American Basswood

GROUNDLAYER (30 Species)

Common at Site:

Acalypha rhomboidea

Three-Seeded Mercury

Aster simplex

Panicled Aster

+\* Boehmeria cylindrica

False Nettle

Carex sp.

Sedge

+ Cephalanthus occidentalis

Buttonbush

Helenium autumnale

Sneezeweed

\* Impatiens biflora

Jewelweed

+\* Laportea canadensis

Wood Nettle

E Leonurus cardiaca

Motherwort

+ Lobelia cardinalis

Cardinal Flower

Polygonum sp.

Smartweed

+\* Rhus radicans

Poison Ivy

+\* Vitis riparia

Riverbank Grape

Intermediate Abundance:

Ambrosia artemisiifolia

Common Ragweed

Bidens cernua

Nodding Bur Marigold

R Decodon verticillatus

Swamp Loosestrife

E(?) Echinochloa crusgalli

Barnyard Grass

Eupatorium rugosum

White Snakeroot

E Fagopyrum esculentum

Buckwheat

+ Leersia oryzoides  
Lysimachia ciliata  
Smilax herbacea

Rice Cutgrass  
 Fringed Loosestrife  
 Common Carrion Flower

Rare at Site:

Geranium maculatum  
Sagittaria latifolia  
 \* Sambucus canadensis  
Staphylea trifolia  
 R+\* Teucrium canadense  
Typha latifolia  
Viola sp.  
Xanthoxylum americanum

Wild Geranium  
 Common Arrowhead  
 Elderberry  
 Bladdernut  
 Germander  
 Common Cattail  
 Violet  
 Prickly Ash

\* On list of prevalent groundlayer species of Wisconsin southern wet-mesic forest (Curtis, 1959).

+ Species is modal in Wisconsin southern wet-mesic forest (Curtis, 1959).

R Species is on list of vascular plants of rare or uncertain status in Iowa (Pusateri, 1982).

E Species is exotic (Swink and Wilhelm, 1979).

species: 26.6%; modal and prevalent species: 33.3%), the majority are common or of intermediate abundance.

If the fluctuations of the river continue to occur as they have in the immediate past, the Sny Magill bottomlands is likely to retain its present character. As shown in Figure 5, the dominant tree species (silver maple, elm, and green ash) are present in a range of size classes. Assuming that there is a positive correlation between size and age, it would appear that these species are reproducing and are capable of replacing themselves. Swamp white oak also shows good reproduction.

The groundlayer will probably vary in character from year to year, depending on the effects of particular floods, but it will probably continue to be relatively open, with few shrubs and saplings. The abundances of particular species may fluctuate widely.

If the river channel changes or is altered, the nature of the Sny Magill forest could also be significantly altered. Depending on the nature of the change, the area could become a wetter community, perhaps dominated by Salix nigra (black willow) and Populus deltoides (cottonwood) or perhaps even by grasses and shrubs; or the area could become more mesic, perhaps tending towards dominance by basswood (Tilia americana) or even sugar maple (Acer saccharum).

### 3. Area 2: North Unit Oak-Maple Woods: North End (Figures 6 and 7); Tables 2, 6, 7, 8, 9, 10 and 11)

#### a. General Description

The north end of the North Unit is a complex of wooded areas interspersed with more open bluffs and rock outcrops. There are sharp topographic changes creating moist ravines as well as dry hilltops. Several tree species dominate different portions of the area including Quercus alba

**Figure 5**

**Size Distribution of Important Tree Species**

**Area 1**

**Sny Magill Bottomland**



(white oak), Carya ovata (shagbark hickory), Quercus borealis (red oak), Populus grandidentata (big-toothed aspen), and Tilia americana (basswood). There is also an abundance of ironwood (Ostrya virginiana) which is spread throughout the area but differs considerably in density from one place to another. Several patches of Carpinus caroliniana (blue beech) occur in the protected moist ravines. The understory in the wooded areas is diverse, with numerous tree seedlings as well as herbs. Juniperus virginiana (eastern red cedar) and Quercus muhlenbergii (chinquapin oak) are found with scattered prairie species (Andropogon scoparius (little bluestem), Aquilegia canadensis (columbine)) near the rock outcrops.

#### b. Description of Community Subunits

There are three distinct subunits in the wooded portions of Area 2 (Figure 6). The majority of the site, Subunit A, consists of an overstory of shagbark hickory, white oak, and green ash (Fraxinus pennsylvanica var. lanceolata). Subunit B is located in the ravine near the center of the unit. This area is dominated by large specimens of red oak and basswood, and by sugar maple (Acer saccharum). Two areas on the northern boundary of the unit and one on a ridge to the south are characterized by the presence of large numbers of white oak and big-toothed aspen. These are designated subunit C.

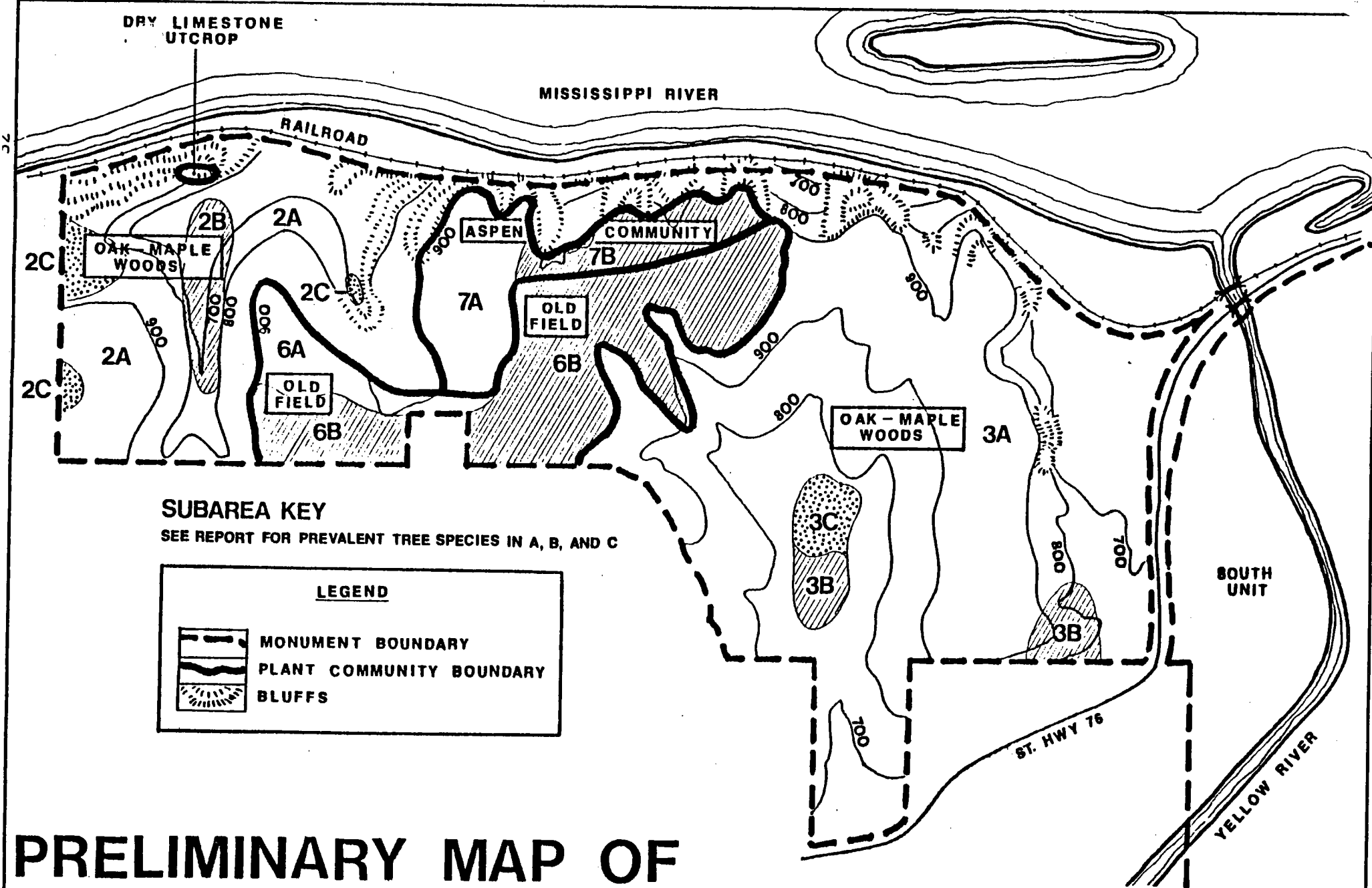
#### c. Discussion of Field Data

A total of 74 species were encountered in the quadrat samples of Area 2, including 42 herbs, 3 vines, and 9 shrubs (Table 2). Twenty tree species were present including seedlings and saplings. This diversity is probably due in part to the wide variety of microclimates present. The overall tree density was 457 stems per hectare. The community is classified as a dry-mesic forest according to Curtis (1959).

**Figure 6**

**Preliminary Map of Plant Communities**

**North Unit Community Subunits**



# PRELIMINARY MAP OF PLANT COMMUNITIES

NORTH UNIT

EFFIGY MOUNDS NATIONAL MONUMENT



0 800' 1/4 MI 1/2 MI

APPROXIMATE SCALE 1" = 800'  
CONTOUR INTERVAL = 100'

Table 6 presents a summary of the tree data. Three species can be considered co-dominants of the area. These are, big-toothed aspen, shagbark hickory, and red oak having Importance Values of 17.9, 17.5 and 16.0 respectively. Ironwood is of secondary importance with an Importance Value of 11.4. Shagbark hickory and ironwood were the most widespread species (40% frequencies) and big-toothed aspen, ironwood and hickory the most numerous (18.2, 14.6 and 19.7 relative density respectively). Although not very widespread or dense, red oak was important because of its large basal area total, an indication of the large size of individual trees (Figure 7).

Of the 12 species found in the tree sample, seven were not encountered in the sapling data (Table 7). Three species which were, ironwood, basswood, and American elm (Ulmus americana), had the highest Importance Values among the saplings and represent the leading dominants in this size class. The sapling layer as a whole was relatively dense at 3400 stems per hectare (102 stems in 300 m<sup>2</sup>).

Table 8 presents the results of the shrub intercept analysis for Area 2, as well as for Areas 3, 4, and 7. Area 2 had a sparse overall shrub cover with prickly ash (Xanthoxylum americanum) being the most prominent species followed by Cornus alternifolia (pagoda dogwood) and pasture gooseberry (Ribes cynosbati).

The understory quadrat data for the upland wooded sites of the Effigy Mounds National Monument, including Area 2, are summarized in Table 9. The species are grouped into two categories--seedlings and herbs, shrubs and vines. In addition, species which are listed as prevalent in southern Wisconsin dry-mesic forests or which are modal to this community (Curtis, 1959) are noted, as are exotics, or species which are rare or unusual (Pusateri, 1982).

Table 6  
Tree Data Summary  
Area 2 (North Unit Oak-Maple Woods: North End)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importanc Value
<u>Acer saccharum</u> (Sugar Maple)	5	6	23.2	6.8	4.4	2.9	4.7
<u>Carya ovata</u> (Shagbark Hickory)	12	27	132.9	16.2	19.7	16.6	17.5
<u>Fraxinus nigra</u> (Black Ash)	2	4	5.8	2.7	2.9	0.7	2.1
<u>Fraxinus pennsylvanica</u> var. <u>lanceolata</u> (Green Ash)	4	10	27.9	5.4	7.3	3.5	5.4
<u>Juglans cinerea</u> (Butternut)	3	4	19.5	4.1	2.9	2.4	3.1
<u>Juglans nigra</u> (Black Walnut)	3	3	17.5	4.1	2.2	2.2	2.8
<u>Ostrya virginiana</u> (Ironwood)	12	20	26.0	16.2	14.6	3.3	11.4
<u>Populus grandidentata</u> (Big-Toothed Aspen)	8	25	196.3	10.8	18.2	24.6	17.9
<u>Quercus alba</u> (White Oak)	5	8	50.1	6.8	5.8	6.3	6.3
<u>Quercus borealis</u> (Red Oak)	9	15	198.7	12.2	10.9	24.9	16.0
<u>Tilia americana</u> (Basswood)	7	11	73.5	9.5	8.0	9.2	8.9
<u>Ulmus americana</u> (American Elm)	4	4	26.8	5.4	2.9	3.4	3.9
Totals	74	137	798.2	100.2	99.8	100	100

**Figure 7**

**Size Distribution of Important Tree Species**

**Area 2**

**North Unit Oak-Maple Woods: North End**

AREA 2    NORTH UNIT    OAK-MAPLE WOODS: NORTH END

NUMBER  
OF  
TREES

## LEGEND

- △ ACER SACCHARUM
- CARYA OVATA
- FRAXINUS PENNSYLVANICA VAR. LANCEOLATA
- ⊙ POPULUS GRANDIDENTATA
- QUERCUS ALBA
- ◇ QUERCUS BOREALIS
- ◆ TILIA AMERICANA
- ◀ ULMUS AMERICANA

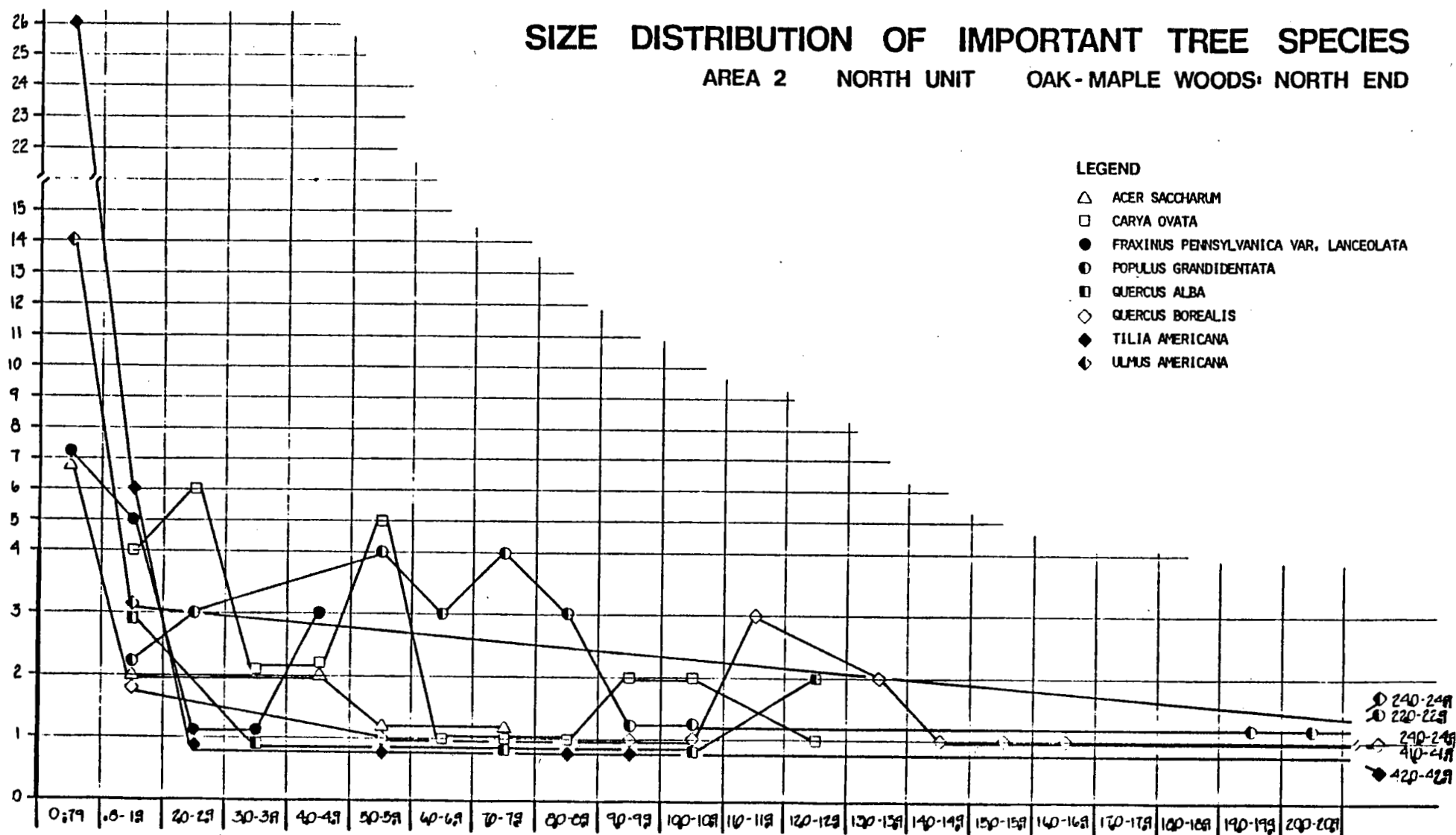
**SIZE CLASS (BASAL AREA IN DM<sup>2</sup>)**

Table 7  
Sapling Data Summary  
Area 2 (North Unit Oak-Maple Woods: North End)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importance Value
<u>Acer saccharum</u> (Sugar Maple)	4	7	0.233	7.7	6.9	2.0	5.5
<u>Carpinus caroliniana</u> (Blue Beech)	3	8	1.206	5.8	7.8	10.1	7.9
<u>Carya cordiformis</u> (Bitternut Hickory)	1	2	0.041	1.9	2.0	0.3	1.4
<u>Fraxinus americana</u> (White Ash)	1	1	0.353	1.9	1.0	3.0	2.0
<u>Fraxinus nigra</u> (Black Ash)	2	7	1.696	3.8	6.9	14.2	8.3
<u>Fraxinus pennsylvanica</u> var. <u>lanceolata</u> (Green Ash)	6	8	0.197	11.5	7.8	1.6	7.0
<u>Ostrya virginiana</u> (Ironwood)	11	26	3.203	21.2	25.5	26.8	24.5
<u>Prunus serotina</u> (Black Cherry)	2	2	1.178	3.8	2.0	9.9	5.2
<u>Tilia americana</u> (Basswood)	10	26	1.325	19.2	25.5	11.1	18.6
<u>Ulmus americana</u> (American Elm)	11	14	2.503	21.2	13.7	21.0	18.6
<u>Crataegus</u> sp. (Hawthorn)	1	1	0.006	1.9	1.0	0.1	1
Totals	52	102	11.941	99.9	100.1	100.1	100

Table 8  
Shrub Cover Estimates (%)  
Upland Woodland Areas

Species	Area 2	Area 3	Area 4	Area 7
<u>Cornus alternifolia</u> (Pagoda Dogwood)	1.6	0.71	0.55	0.86
<u>Cornus racemosa</u> (Gray Dogwood)	0.52	0.00	1.8	0.28
<u>Corylus americana</u> (Hazelnut)	0.89	0.20	1.7	0.90
<u>Ribes cynosbati</u> (Pasture Gooseberry)	1.4	0.41	1.2	0.75
<u>Ribes missouriense</u> (Wild Gooseberry)	0.36	0.34	0.00	0.30
<u>Rosa sp.</u> (Wild Rose)	0.00	0.00	0.01	0.00
<u>Rubus allegheniensis</u> (Wild Blackberry)	0.68	0.17	0.18	0.79
<u>Rubus strigosus</u> (Red Raspberry)	0.00	0.00	0.31	0.00
<u>Sambucus canadensis</u> (Elderberry)	0.00	0.00	0.00	0.40
<u>Staphylea trifolia</u> (Bladdernut)	0.73	0.48	0.33	0.00
<u>Viburnum lentago</u> (Nannyberry)	0.12	0.01	0.01	0.00
<u>Xanthoxylum americanum</u> (Prickly Ash)	3.6	0.90	1.1	0.58
Totals	9.9	3.2	7.2	4.9

TABLE 9  
UNDERSTORY DATA SUMMARY  
UPLAND WOODLAND AREAS

SPECIES	AREA 2					AREA 3					AREA 4					AREA 7				
Tree Seedlings	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV
<u>Acer saccharum</u> (Sugar Maple)	13.3	0.27	1.4	0.5	1.0	26.7	0.60	3.0	1.5	2.3	22.6	0.29	2.2	0.5	1.4					
<u>Carpinus caroliniana</u> (Blue Beech)											3.2	0.23	0.3	0.4	0.4					
<u>Carya cordiformis</u> (Bitternut Hickory)	16.7	0.17	1.7	0.3	1.0	10.0	0.13	1.1	0.3	0.7	16.1	0.19	1.6	0.4	1.0					
<u>Carya ovata</u> (Shagbark Hickory)	10.0	0.10	1.0	0.2	0.6						6.5	0.06	0.6	0.1	0.4					
<u>Celtis occidentalis</u> (Hackberry)	6.7	0.07	0.7	0.1	0.4	3.3	0.03	0.4	0.1	0.3										
<u>Crataegus sp.</u> (Hawthorn)	3.3	0.03	0.3	0.1	0.2															
<u>Fraxinus pennsylvanica</u> (Red Ash)	3.3	0.03	0.3	0.1	0.2						12.9	0.16	1.3	0.2	0.8					
<u>Fraxinus pennsylvanica</u> var. <u>lanceolata</u> (Green Ash)	30.0	0.50	3.1	0.9	2.0	10.0	0.10	1.1	0.2	0.7	9.7	0.13	0.9	0.3	0.6	6.7	0.13	0.8	0.3	0.6
<u>Juglans cinerea</u> (Butternut)	3.3	0.03	0.3	0.1	0.2															
<u>Ostrya virginiana</u> (Ironwood)	16.7	0.67	1.7	1.2	1.5	6.7	0.13	0.7	0.3	0.5	6.5	0.06	0.6	0.1	0.4					
<u>Populus grandidentata</u> (Big-Toothed Aspen)	6.7	0.07	0.7	0.1	0.4															
<u>Populus tremuloides</u> (Trembling Aspen)	3.3	0.03	0.3	0.2	0.3						3.2	0.03	0.3	0.1	0.2					
<u>Prunus serotina</u> (Black Cherry)	10	0.23	1.0	0.4	0.7	3.3	0.03	0.4	0.1	0.3	6.5	0.26	0.6	0.5	0.6	6.7	0.07	0.8	0.2	0.5

TABLE 9 Continued

SPECIES	AREA 2					AREA 3					AREA 4					AREA 7				
	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV
<u>Prunus virginiana</u> (Choke Cherry)						6.7	0.13	0.7	0.3	0.5	3.2	0.03	0.3	0.1	0.2					
<u>Quercus alba</u> (White Oak)	3.3	0.03	0.3	0.1	0.2	3.3	0.03	0.4	0.1	0.3						6.7	0.07	0.8	0.2	0.5
<u>Quercus borealis</u> (Red Oak)	6.7	0.07	0.7	0.1	0.4	3.3	0.07	0.4	0.2	0.3	9.7	0.13	0.9	0.2	0.6	6.7	0.07	0.8	0.2	0.5
<u>Tilia americana</u> (Basswood)	10.0	0.37	1.0	0.7	0.9	3.3	0.03	0.4	0.1	0.3	6.5	0.19	0.6	0.4	0.5	6.7	0.20	0.8	0.5	0.7
<u>Ulmus americana</u> (American Elm)	26.7	0.93	2.7	1.7	2.2	36.7	0.80	4.1	1.9	3.0	19.4	0.35	1.9	0.7	1.3	20.0	0.47	2.4	1.1	1.8
Herbs, Shrubs, Vines																				
<u>Actaea rubra</u> (Baneberry)						3.3	0.10	0.4	0.2	0.3										
++ <u>Adiantum pedatum</u> (Maidenhair Fern)	6.7	0.07	0.7	0.1	0.4	10.0	0.13	1.1	0.3	0.7	12.9	0.39	1.3	0.7	1.0	6.7	0.07	0.8	0.2	0.5
* <u>Agrimonia gryposepala</u> (Agrimony)	3.3	0.07	0.3	0.1	0.2															
++ <u>Amphicarpa bracteata</u> (Hog Peanut)	43.3	3.03	4.5	5.7	5.1	10.0	0.20	1.1	0.5	0.8	35.5	2.58	3.4	4.8	4.1	33.3	0.93	4.0	2.2	3.1
* <u>Aralia nudicaulis</u> (Wild Sarsaparilla)						6.7	0.33	0.7	0.8	0.8	9.7	0.13	0.9	0.2	0.6					
++ <u>Aralia racemosa</u> (Spikenard)											3.2	0.03	0.3	0.1	0.2					

TABLE 9 Continued

SPECIES	AREA 2					AREA 3					AREA 4					AREA 7				
	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV
** <i>Arisaema triphyllum</i> (Jack-in-the-Pulpit)	26.7	0.67	2.7	1.2	2.0	13.3	0.30	1.5	0.7	1.1	22.6	0.84	2.2	1.5	1.9	13.3	0.27	1.6	0.6	1.1
<i>Asarum canadense</i> (Wild Ginger)						20.0	1.73	2.2	4.2	3.2	16.1	0.90	1.6	1.7	1.7					
<i>Aster simplex</i> (Panicled Aster)																13.3	0.60	1.6	1.4	1.5
** <i>Athyrium filix-femina</i> (Lady Fern)	10.0	0.17	1.0	0.3	0.7	16.7	0.53	1.9	1.3	1.6	16.1	0.45	1.6	0.8	1.7	20.0	0.60	2.4	1.4	1.9
<i>Boehmeria cylindrica</i> (False Nettle)	23.3	3.17	2.4	5.9	4.2	20.0	6.70	2.2	16.3	9.3	22.6	8.26	2.2	15.3	8.8	20.0	5.07	2.4	12.1	7.3
** <i>Botrychium virginianum</i> (Rattlesnake Fern)	10.0	0.10	1.0	0.2	0.6	16.7	0.17	1.9	0.4	1.2	3.2	0.16	0.3	0.3	0.3	6.7	0.07	0.8	0.2	0.5
** <i>Carex pensylvanica</i> (Pennsylvania sedge)	3.3	0.17	0.3	0.3	0.3						3.2	0.29	0.3	0.5	0.4	20.0	0.27	2.4	0.6	1.5
<i>Carex</i> sp. (Unidentified sedges)	26.7	1.93	2.7	3.6	3.2	10.0	0.13	1.1	0.3	0.7	29.0	0.97	2.8	1.8	2.3	33.3	0.53	4.0	1.3	2.7
* <i>Caulophyllum thalictroides</i> (Blue Cohosh)	3.3	0.03	0.3	0.1	0.2															
<i>Ceanothus americanus</i> (New Jersey Tea)	3.3	0.07	0.3	0.1	0.2															
** <i>Celastrus scandens</i> (Bittersweet)	10.0	0.10	1.0	0.2	0.6						3.2	0.03	0.3	0.1	0.2					
** <i>Circaea quadrisulcata</i> (Enchanter's Nightshade)	63.3	4.50	6.5	8.4	7.5	36.7	2.53	4.1	6.1	5.1	45.2	3.87	4.4	7.2	5.8	46.7	2.87	5.6	6.9	6.3

TABLE 9 Continued

SPECIES	AREA 2					AREA 3					AREA 4					AREA 7				
	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV
+* <u>Cornus alternifolia</u> (Pagoda Dogwood)	3.3	0.03	0.3	0.1	0.2						3.2	0.19	0.3	0.4	0.4	6.7	0.27	0.8	0.6	0.7
* <u>Cornus racemosa</u> (Gray Dogwood)	3.3	0.17	0.3	0.3	0.3						9.7	0.48	0.9	0.9	0.9					
* <u>Corylus americana</u> (Hazelnut)	3.3	0.27	0.3	0.5	0.4						3.2	0.03	0.3	0.1	0.2					
+* <u>Cryptotaenia canadensis</u> (Honewort)	26.7	3.33	2.7	6.2	4.5	6.7	0.37	0.7	0.9	0.8	25.8	1.90	2.5	3.5	3.0	40.0	1.73	4.8	4.2	4.5
<u>Cystopteris bulbifera</u> (Bulblet Fern)	3.3	0.03	0.3	0.1	0.2	10.0	0.27	1.1	0.6	0.9	16.1	0.61	1.6	1.1	1.4					
* <u>Desmodium glutinosum</u> (Tick Trefoil)	3.3	0.07	0.3	0.1	0.2	10.0	0.40	1.1	1.0	1.1	16.1	0.42	1.6	0.8	1.2	6.7	0.13	0.8	0.3	0.6
+* <u>Dioscorea villosa</u> (Wild Yam)											19.4	0.32	1.9	0.6	1.3	13.3	0.27	1.6	0.6	1.1
<u>Equisetum arvense</u> (Horsetail)	3.3	0.03	0.3	0.1	0.2															
+ <u>Eupatorium rugosum</u> (White Snakeroot)											3.2	0.03	0.3	0.1	0.2					
* <u>Fragaria virginiana</u> (Wild Strawberry)											6.5	2.5	0.6	4.6	2.6					
<u>Galium boreale</u> (Northern Bedstraw)	3.3	0.07	0.3	0.1	0.2	43.3	0.93	4.8	2.3	3.6	9.7	0.13	0.9	0.2	0.6	26.7	1.6	3.2	3.8	3.5
* <u>Galium triflorum</u> (Sweet-Scented Bedstraw)	26.7	1.40	2.7	2.6	2.7	6.7	0.63	0.7	1.5	1.1	22.6	1.32	2.2	2.4	2.3					



TABLE 9 Continued

SPECIES	AREA 2					AREA 3					AREA 4					AREA 7				
	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV
R+ <i>Oryzopsis racemosa</i> (Black-seeded Rice Grass)	3.3	0.03	0.3	0.1	0.2	10.0	0.27	1.1	0.6	0.9	3.2	0.03	0.3	0.1	0.2	6.7	0.33	0.8	0.8	0.8
** <i>Osmorhiza claytoni</i> (Sweet Cicely)	83.3	4.43	8.6	8.3	8.5	73.3	4.07	8.1	9.9	9.0	71.0	3.39	6.9	6.3	6.6	73.3	3.67	8.8	8.8	8.8
** <i>Osmunda claytoniana</i> (Interrupted Fern)						6.7	0.07	0.7	0.2	0.5	9.7	0.19	0.9	0.4	0.7					
<i>Oxalis stricta</i> (Wood Sorrel)											3.2	0.03	0.3	0.1	0.2	6.7	0.07	0.8	0.2	0.5
* <i>Parthenocissus quinquefolia</i> (Virginia Creeper)	83.3	13.8	8.6	25.8	17.2	76.7	7.03	8.5	17.1	12.8	64.5	6.71	6.3	12.4	9.4	93.3	8.87	11.2	21.2	16.2
<i>Phlox divaricata</i> (Woods Phlox)						6.7	0.27	0.7	0.6	0.7										
** <i>Phytolacca leptostachya</i> (Lopseed)	46.7	1.83	4.8	3.4	4.1						9.7	0.26	0.9	0.5	0.7	20.0	0.47	2.4	1.1	1.8
* <i>Podophyllum peltatum</i> (Mayapple)	3.3	0.07	0.3	0.1	0.2	20.0	0.43	2.2	1.1	1.7	16.1	0.26	1.6	0.5	1.1					
+ <i>Polemonium reptans</i> (Jacob's Ladder)						6.7	0.10	0.7	0.2	0.5										
<i>Potentilla simplex</i> (Common Cinquefoil)	3.3	0.20	0.3	0.4	0.4															
** <i>Prenanthes alba</i> (Lion's Foot)	3.3	0.03	0.3	0.1	0.2	3.3	0.03	0.4	0.1	0.3										
<i>Pycnanthemum virginianum</i> (Mountain Mint)	6.7	0.27	0.7	0.5	0.6															

TABLE 9 Continued

SPECIES	AREA 2					AREA 3					AREA 4					AREA 7				
	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV
+* <u>Ranunculus abortivus</u> (Aborted Buttercup)	3.3	0.03	0.3	0.1	0.2	6.7	0.10	0.7	0.2	0.5	6.5	0.16	0.6	0.3	0.5					
* <u>Rhus radicans</u> (Poison Ivy)	6.7	0.73	0.7	1.4	1.1	3.3	0.10	0.4	0.2	0.3	12.9	0.32	1.3	0.6	1.0					
+* <u>Ribes cynosbati</u> (Pasture Gooseberry)	6.7	0.37	0.7	0.7	0.7						12.9	0.48	1.3	0.9	1.1	6.7	0.33	0.8	0.8	0.8
<u>Ribes missouriense</u> (Wild Gooseberry)	3.3	0.20	0.3	0.4	0.4	3.3	0.07	0.4	0.2	0.3						20.0	1.00	2.4	2.4	2.4
* <u>Rubus allegheniensis</u> (Wild Blackberry)	20.0	0.37	2.1	0.7	1.4	6.7	0.07	0.7	0.2	0.5	12.9	0.23	1.3	0.4	0.9	6.7	0.07	0.8	0.2	0.5
* <u>Sambucus canadensis</u> (Elderberry)																6.7	0.07	0.8	0.2	0.5
* <u>Sanguinaria canadensis</u> (Bloodroot)	6.7	0.07	0.7	0.1	0.4	23.3	0.50	2.6	1.2	1.9	16.1	0.32	1.6	0.6	1.1	13.3	0.13	1.6	0.3	1.0
+* <u>Sanicula gregaria</u> (Black Snakeroot)	46.7	4.67	4.8	8.7	6.8	6.7	0.27	0.7	0.6	0.7	22.6	0.97	2.2	1.8	2.0	53.3	3.93	6.4	9.4	7.9
* <u>Scrophularia marilandica</u> (Figwort)																13.3	0.13	1.6	0.3	1.0
* <u>Smilacina racemosa</u> (False Solomon's Seal)	13.3	0.23	1.4	0.4	0.9	23.3	0.57	2.6	1.4	2.0	22.6	0.35	2.2	0.7	1.5					
<u>Smilacina stellata</u> (Starry False Solomon's Seal)						3.3	0.07	0.4	0.2	0.3										
* <u>Smilax herbacea</u> (Carrion Flower)	6.7	0.10	0.7	0.2	0.5															

TABLE 9 Continued

SPECIES	AREA 2					AREA 3					AREA 4					AREA 7				
	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV	F	D	%F	%D	IV
<u>Solidago flexicaulis</u> (Zig-Zag Goldenrod)	10.0	0.37	1.0	0.7	0.9	26.7	0.47	3.0	1.1	2.1	19.4	0.74	1.9	1.4	1.7	13.3	0.33	1.6	0.8	1.2
<u>Solidago nemoralis</u> (Dyer's Weed)											6.5	0.13	0.6	0.2	0.4					
<u>Staphylea trifolia</u> (Bladdernut)						6.7	0.07	0.7	0.2	0.5										
<u>Rteucrum canadense</u> (Germander)											3.2	0.06	0.3	0.1	0.2					
** <u>Thalictrum dioicum</u> (Early Meadow Rue)						6.7	0.10	0.7	0.2	0.5	16.1	0.65	1.6	1.2	1.4					
<u>Trillium cernuum</u> (Nodding Trillium)						6.7	0.23	0.7	0.6	0.7										
** <u>Uvularia grandiflora</u> (Bellwort)	13.3	0.17	1.4	0.3	0.9	46.7	1.37	5.2	3.3	4.3	22.6	0.87	2.2	1.6	1.9	20.0	1.40	2.4	3.4	2.9
* <u>Viburnum lentago</u> (Nannyberry)	3.3	0.03	0.3	0.1	0.2	3.3	0.07	0.4	0.2	0.3	9.7	0.16	0.9	0.3	0.6					
* <u>Viola pubescens</u> (Hairy Yellow Violet)	20.0	0.33	2.1	0.6	1.4	13.3	0.23	1.5	0.6	1.1	22.6	0.39	2.2	0.7	1.5	13.3	0.20	1.6	0.5	1.1
<u>Vitis riparia</u> (Riverbank Grape)	3.3	0.03	0.3	0.1	0.2															
** <u>Xanthoxylum americanum</u> (Prickly Ash)	13.3	0.20	1.4	0.4	0.9	3.3	0.10	0.4	0.2	0.3	9.7	0.16	0.9	0.3	0.6					
Unknown Grasses	26.7	0.47	2.7	0.9	1.8	23.3	1.03	2.6	2.5	2.6	6.5	0.16	0.6	0.3	0.5					
Unknown Herbs	3.3	0.03	0.3	0.1	0.2	23.3	0.43	2.6	1.1	1.9	16.1	0.35	1.6	0.7	1.2	6.7	0.07	0.8	0.2	0.5

TABLE 9 Continued

- F      Frequency (%)  
          (Number of quadrats of occurrence  $\div$  Total number of quadrats sampled)  $\times$  100
- D      Density (number per m<sup>2</sup>)  
          Number of plants sampled  $\div$  (Total number of quadrats sampled  $\times$  area of one quadrat (1m<sup>2</sup>))
- %F     Relative Frequency  
          (Frequency of a species  $\div$  Sum of frequencies of all species)  $\times$  100
- %D     Relative Density  
          (Density of a species  $\div$  Sum of densities of all species)  $\times$  100
- IV      Importance Value  
          (%F + %D)  $\div$  2
- \*      On list of prevalent groundlayer species of Wisconsin southern dry-mesic forest (Curtis, 1959)
- +      Species is modal in Wisconsin dry-mesic forest
- R      Species is on list of vascular plants of rare or uncertain status in Iowa (Pusateri, 1982)
- E      Species is exotic (Swink and Wilhelm, 1979)

Area 2 contains a wide variety of seedlings, four of which--green ash (30% frequency, 0.50 stems per  $m^2$ ), American elm (26.7% frequency, 0.93 stems per  $m^2$ ), ironwood (16.7% frequency, 0.67 stems per  $m^2$  density), and bitternut hickory (Carya cordiformis) (16.7% frequency, 0.17 stems per  $m^2$  density)--were fairly widespread. The list of 54 herbs, shrubs, and vines includes 35 prevalent and 22 modal species. One species is an exotic (Lactuca scariola, prickly lettuce), but it was found in only one quadrat (3.3% frequency). Oryzopsis racemosa (black-seeded rice grass), is listed by Pusateri (1982) as threatened in Iowa. Also of interest is the presence of Orchis spectabilis (showy orchid).

The importance Values of the understory species range from 17.2 to 0.2. Table 10 lists the fifteen species with the highest Importance Values. Parthenocissus quinquefolia (Virginia creeper) is by far the most prominent of these followed by Osmorhiza claytoni (sweet cicely) and Circaea quadrisulcata (enchanter's nightshade). All three species were widespread with high frequency and density figures.

A species list for the entire North Unit Oak-Maple Woods was compiled during a walk-through survey on September 19, 1982. As most of our time was spent in the south end (Area 3), the list will be discussed in a later section of this report. We did, however, compile a species list for a large limestone outcrop in the northeastern portion of Area 2. This list is presented as Table 11.

#### d. Community Analysis

Area 2 is a woodland composed of a mosaic of patches dominated by different species groupings. In general, the community is characteristic of a forest that has been disturbed at some time in the past. The large numbers of big-toothed aspen that dominate part of the area, as well as the

Table 10  
Fifteen Most Important Understory Herbs, Shrubs, Vines  
Area 2

Species	Importance Value
<u>Parthenocissus quinquefolia</u>	17.2
<u>Osmorhiza claytoni</u>	8.5
<u>Circaea quadrisulcata</u>	7.5
<u>Sanicula gregaria</u>	6.8
<u>Amphicarpa bracteata</u>	5.1
<u>Cryptotaenia canadensis</u>	4.5
<u>Boehmeria cylindrica</u>	4.2
<u>Phryma leptostachya</u>	4.1
<u>Carex</u> sp.	3.2
<u>Galium triflorum</u>	2.7
<u>Arisaema triphyllum</u>	2.0
(Unknown Grasses)	(1.8)
<u>Rubus allegheniensis</u>	1.4
<u>Viola pubescens</u>	1.4
<u>Hepatica acutiloba</u>	1.2

Table 11  
Species Presence List  
North Unit Near Limestone Outcrop  
19 September 1982

TREES (3 Species)

Intermediate Abundance:

Quercus alba

White Oak

Rare at Site:

Juniperus virginiana

Eastern Red Cedar

Quercus muhlenbergii

Chinquapin Oak

GROUND LAYER (12 Species)

Intermediate Abundance:

Asclepias verticillata

Whorled Milkweed

Rare at Site:

Amorpha canescens

Leadplant

Andropogon gerardi

Big Bluestem

Andropogon scoparius

Little Bluestem

Apocynum androsaemifolium

Spreading Dogbane

Aquilegia canadensis

Columbine

Bouteloua hirsuta

Hairy Grama

Elymus canadensis

Canada Wild Rye

Euphorbia corollata

Flowering Spurge

Pellaea glabella

Purple Cliff Brake

Rosa sp.

Rose

Sporobolus heterolepis

Prairie Dropseed

presence of multiple-trunked basswood, and many large red oak trees lend support to this idea.

The groundlayer is diverse and very characteristic of a good quality dry-mesic forest community. The number of species (54) found in the sample is greater than the average number of species (50) found by Curtis in samples of what he considered to be high quality, representative communities of this type (Howell, 1975). Similarly, Curtis found 30 prevalent species on the average in any one stand (Howell, 1975); our sample contained 35. The one exotic species, prickly lettuce, is of little importance, and so does not detract from the overall quality of the area. Several relatively uncommon species are present, including the previously mentioned showy orchis, Mitella diphylla (bishop's cap), Caulophyllum thalictroides (blue cohosh) and Cystopteris bulbifera (bulblet fern). The fact that one species is rare or endangered (black-seeded grass) adds to the importance of the area.

The presence of large numbers of saplings and seedlings is a good indication that tree reproduction is occurring. The most prominent species in this regard is basswood. As can be seen in Figure 7, many of the species in the larger size classes are not present as saplings. Most noticeable in this regard are red oak, big-toothed aspen, and, to a large extent, shagbark hickory. It would appear that if the trends indicated in the sapling data continue, the forest will eventually change in composition towards greater dominance by basswood, and perhaps by elm and sugar maple. Sugar maple is at present a relatively minor component of the tree and sapling size classes, but the understory contains a fair number of maple seedlings.

4. Area 3: North Unit Oak-Maple Woods: South End (Figures 6 and 8; Tables 2, 8, 9, 12, 13, 14, 15)

### a. General Description

Area 3 is dominated by sugar maple (Acer saccharum) which is present in all sizes throughout the site. Red oak (Quercus borealis) is also abundant (particularly as large trees) as is basswood (Tilia americana). Rock outcrops and exposed southwest facing bluffs also occur in the area. These more xeric sites are dominated by Quercus alba (white oak).

The groundlayer is diverse and patchy. There are large stands of interrupted fern (Osmunda claytoniana) and of lady fern (Athyrium filix-femina). Of particular interest is the presence of six rare or threatened species (Pusateri, 1982). These are Dodecatheon amethystinum (jeweled shooting star), listed as being endangered in Iowa; Cypripedium calceolus var. pubescens (yellow lady's slipper orchid), Aplectrum hyemale (putty root orchid); Oryzopsis racemosa (black-seeded rice grass), and Hydrastis canadensis (golden seal), all listed as threatened in Iowa; and Teucrium canadense (germander) listed as being of undetermined status in Iowa. In our initial, qualitative survey of the area, we also listed Galium asprellum (rough bedstraw) which Pusateri (1982) notes as being threatened in Iowa (Table 15). This identification should be regarded as tentative.

The overall spatial character is one of several interconnected, open rooms. The tall canopy forms a high ceiling, tree trunks and topographic changes form the walls, and the groundlayer softens and defines the floor. Colors are particularly interesting in the spring when the majority of the species are in bloom, and in the fall as the leaves in the canopy change color. The foliage of the groundlayer plants provides many textural contrasts throughout the growing season. Particularly noteworthy in this regard are the large clumps of ferns and the many groups of fine-textured sedges found in the area.

### b. Description of Community Subunits

Figure 6 depicts the location of three subunits within Area

3. By far the largest portion of the site (Subunit A) is characterized by maple, red oak and basswood. Subunit B, toward the southwest end of the area is more xeric and has an abundance of white oak and Carya ovata (shagbark hickory). Chinquapin oak (Quercus muhlenbergii) also occurs here. More mesic species such as maple, basswood and american elm (Ulmus americana) are still represented, but they are smaller than the oaks and hickory. Subunit C is composed primarily of Populus grandidentata (big-toothed aspen), and probably represents a disturbance gap.

### c. Discussion of Field Data

Area 3 has a continuum index (C.I.) of 713 (Curtis, 1959) and falls on the mesic side of communities classified as dry-mesic forests (C.I. 432 to 766) (Table 2). The quadrat samples contained 46 herbs, shrubs, and vines and 17 tree species, 13 of which were tree-sized. Overall tree density was 407 stems per hectare. Tables 12 and 13 indicate that sugar maple dominated the canopy and midstory with an Importance Value of 36.1 among the trees and of 51.4 among the saplings. The species was widespread and present at relatively high densities (200 trees per hectare, 140 saplings per hectare). Red oak was also a dominant member of the canopy (I.V. = 21.7) as were white oak (I.V. = 10.6) and basswood (I.V. = 10.7). Red and white oak were especially important in the larger size classes (Figure 8). These species were not present among the saplings.

The midstory was generally sparse. Overall sapling density was 1733 stems per hectare, approximately half that noted for Area 2. The shrub cover was also low (Table 8) with 8 species providing a total of 3.2% cover. Prickly

Table 12  
Tree Data Summary  
Area 3 (North Unit Oak-Maple Woods: South End)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importanc Value
<u>Acer saccharum</u> (Sugar Maple)	26	52	237.4	35.1	42.6	30.7	36.1
<u>Carya ovata</u> (Shagbark Hickory)	3	4	13.1	4.1	3.3	1.7	3.0
<u>Celtis occidentalis</u> (Hackberry)	1	1	4.5	1.4	0.8	0.6	0.9
<u>Fraxinus americana</u> (White Ash)	2	2	5.8	2.7	1.6	0.7	1.7
<u>Ostrya virginiana</u> (Ironwood)	3	4	4.6	4.1	3.3	0.6	2.7
<u>Populus grandidentata</u> (Big-Toothed Aspen)	2	4	30.0	2.7	3.3	3.9	3.3
<u>Populus tremuloides</u> (Trembling Aspen)	1	1	5.5	1.4	0.8	0.7	1.0
<u>Prunus serotina</u> (Black Cherry)	1	1	5.0	1.4	0.8	0.6	0.9
<u>Quercus alba</u> (White Oak)	7	9	116.0	9.5	7.4	15.0	10.6
<u>Quercus borealis</u> (Red Oak)	14	21	223.7	18.9	17.2	28.9	21.7
<u>Quercus muhlenbergii</u> (Chinquapin oak)	1	4	17.8	1.4	3.3	2.3	2.3
<u>Tilia americana</u> (Basswood)	8	14	75.6	10.8	11.5	9.8	10.7
<u>Ulmus americana</u> (American Elm)	5	5	35.5	6.8	4.1	4.6	5.2
Totals	74	122	774.5	100.3	100	100.1	100.1

Table 13  
Sapling Data Summary  
Area 3 (North Unit Oak-Maple Woods: South End)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importanc Value
<u>Acer saccharum</u> (Sugar Maple)	15	21	3.624	42.9	40.4	70.9	51.4
<u>Carya cordiformis</u> (Bitternut Hickory)	5	7	0.491	14.3	13.5	9.6	12.5
<u>Celtis occidentalis</u> (Hackberry)	1	1	0.020	2.9	1.9	0.4	1.7
<u>Fraxinus pennsylvanica</u> (Red Ash)	1	1	0.020	2.9	1.9	0.4	1.7
<u>Fraxinus pennsylvanica</u> var. <u>lanceolata</u> (Green Ash)	1	1	0.038	2.9	1.9	0.7	1.8
<u>Ostrya virginiana</u> (Ironwood)	1	2	0.410	2.9	3.8	8.0	4.9
<u>Ulmus americana</u> (American Elm)	11	19	0.508	31.4	36.5	9.9	25.9
Totals	35	52	5.111	100.2	99.9	99.9	99.9

**Figure 8**

**Size Distribution of Important Tree Species**

**Area 3**

**North Unit Oak-Maple Woods: South End**

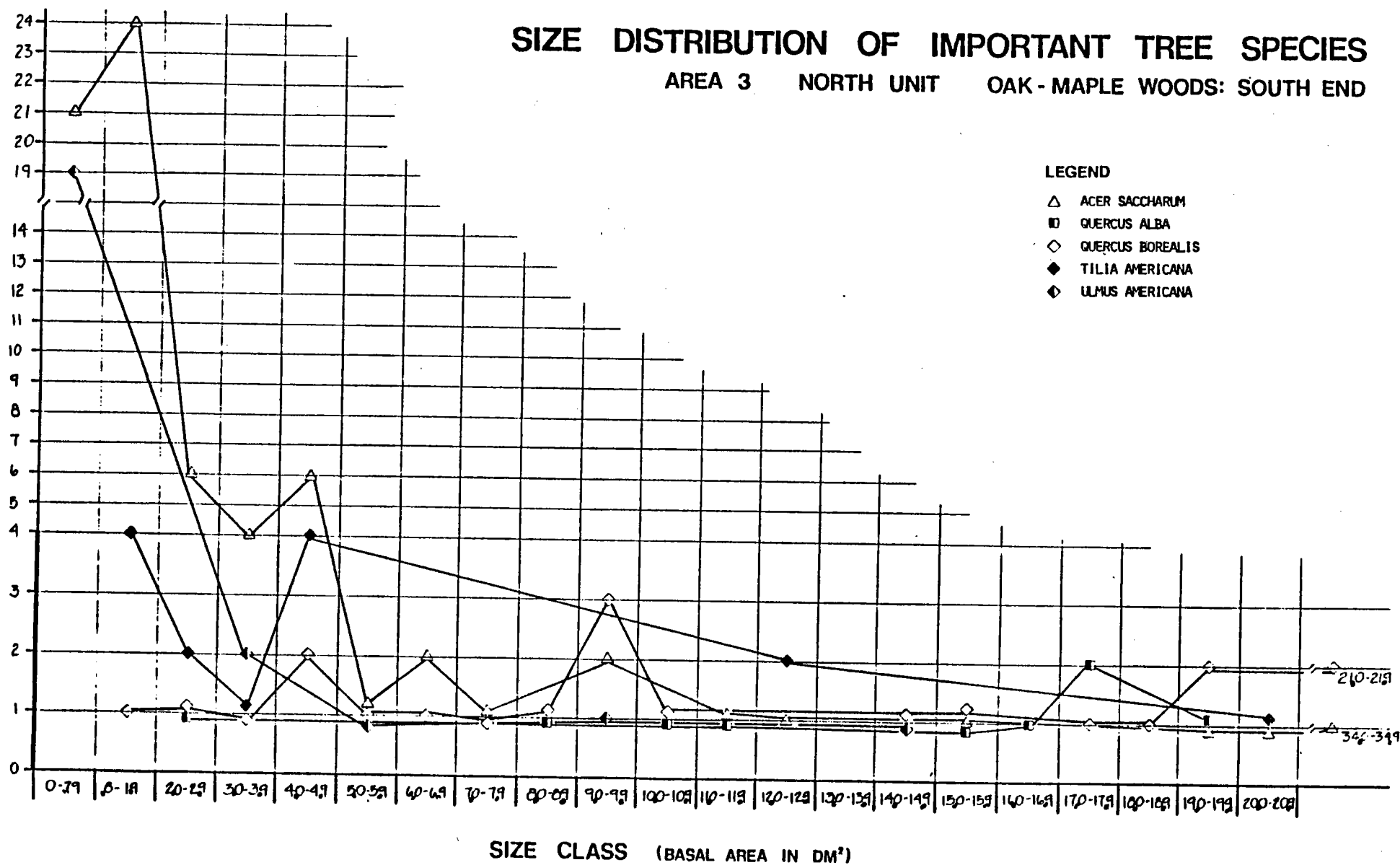
# SIZE DISTRIBUTION OF IMPORTANT TREE SPECIES

AREA 3 NORTH UNIT OAK - MAPLE WOODS: SOUTH END

## LEGEND

- △ ACER SACCHARUM
- QUERCUS ALBA
- ◇ QUERCUS BOREALIS
- ◆ TILIA AMERICANA
- ◊ ULMUS AMERICANA

NUMBER  
OF  
TREES



ash (Xanthoxylum americanum) and pagoda dogwood (Cornus alternifolia) were the dominant shrub species.

The understory quadrat sample contained 27 dry-mesic prevalents and 19 species that are modal in this community (Table 9). Parthenocissus quinquefolia (Virginia creeper), Boehmeria cylindrica (false nettle), and Osmorhiza claytoni (sweet cicely) were the dominant species in the understory with Importance Values of 12.8, 9.3, and 9.0 respectively (Table 14). American elm and sugar maple were the most prominent tree seedlings (Table 9). The sample contained one rare species (Oryzopsis racemosa (black-seeded rice grass) and no exotics.

Tables 15 and 16 present species lists compiled during two walk-through surveys of the area. Several interesting species appear here which were not found in the quantitative sample, including Ulmus rubra (slippery elm), Orchis spectabilis (showy orchid), Allium tricoccum (Wild leak), Anemone quinquefolia (wood anemone), Anemonella thalictroides (rue anemone), Dicentra cucullaria (Dutchman's breeches), Phlox divaricata (blue phlox), and Trillium cernuum (nodding trillium).

#### d. Community Analysis

The south end of the North Unit is a high quality maple woods containing several interesting and unusual species. The canopy is diverse in that it contains several species (13 in the quadrat sample (Table 2); 18 in

Table 14  
Fifteen Most Important Understory Herbs, Shrubs, Vines  
Area 3

Species	Importance Value
<u>Parthenocissus quinquefolia</u>	12.8
<u>Boehmeria cylindrica</u>	9.3
<u>Osmorhiza claytoni</u>	9.0
<u>Circaea quadrisulcata</u>	5.1
<u>Uvularia grandiflora</u>	4.3
<u>Galium boreale</u>	3.6
<u>Asarum canadense</u>	3.2
<u>Mitella diphylla</u>	3.1
<u>Hepatica acutiloba</u>	2.9
<u>Laportea canadensis</u>	2.6
(Unknown Grasses)	(2.6)
<u>Geranium maculatum</u>	2.2
<u>Solidago flexicaulis</u>	2.1
<u>Smilacina racemosa</u>	2.0
<u>Sanguinaria canadensis</u>	1.9
(Unknown Herbs)	(1.9)

Table 15  
Species Presence List  
North Unit Oak-Maple Woods  
19 September 1982

Trees (18 species)

Common at site:

Acer saccharum  
Quercus alba  
Quercus borealis

Sugar Maple  
White Oak  
Red Oak

Intermediate Abundance:

Acer negundo  
Carya cordiformis  
Carya ovata  
Celtis occidentalis  
Fraxinus pennsylvanica  
Juglans nigra  
Ostrya virginiana  
Prunus serotina  
Tilia americana  
Ulmus americana  
Ulmus rubra

Box Elder  
Bitternut Hickory  
Shagbark Hickory  
Hackberry  
Green Ash  
Black Walnut  
Ironwood  
Black Cherry  
American Basswood  
American Elm  
Slippery Elm

Rare at Site:

Acer rubrum  
Acer saccharinum  
Carpinus caroliniana  
Gleditsia triacanthos

Red Maple  
Silver Maple  
Blue Beech  
Honey Locust

Groundlayer (68 species)

Common at Site:

Acalypha rhomboidea  
\* Agrimonia gryposepala  
+\* Amphicarpa bracteata  
Asarum canadense  
Boehmeria cylindrica  
+\* Circaea quadrisulcata  
+\* Cryptotaenia canadensis  
\* Desmodium glutinosum  
Erigeron  
+ Eupatorium rugosum  
R Galium asprellum (?)  
\* Hydrophyllum virginianum  
Impatiens biflora  
+\* Osmorhiza claytoni

Three-Seeded Mercury  
Tall Agrimony  
Hog Peanut  
Wild Ginger  
False Nettle  
Enchanter's Nightshade  
Honeysuckle  
Pointed Tick Trefoil  
Fleabane  
White Snakeroot  
Rough Bedstraw  
Virginia Waterleaf  
Jewelweed  
Hairy Sweet Cicely

Oxalis stricta  
 \* Parthenocissus quinquefolia  
 +\* Phryma leptostachya  
 +\* Sanicula gregaria  
Smilax herbacea

Common Wood Sorrel  
 Virginia Creeper  
 Lopseed  
 Black Snakeroot  
 Common Carrion Flower

#### Intermediate Abundance:

\* Anemone quinquefolia  
Antennaria neglecta  
Asclepias syriaca  
Aster lateriflorus  
 + Campanula americana  
Cirsium sp.  
 \* Cornus racemosa  
 \* Corylus americana  
 +\* Dioscorea villosa  
 \* Fragaria virginiana  
 +\* Geranium maculatum  
 \* Hepatica acutiloba  
Lactuca floridana  
 E Lactuca scariola  
Laportea canadensis  
Lobelia siphilitica  
 +\* Prenanthes alba  
 \* Pteridium aquilinum  
 \* Rhus radicans  
 +\* Ribes cynosbati  
 \* Rubus allegheniensis  
 \* Rubus strigosus  
 \* Smilacina racemosa  
Solidago nemoralis  
 +\* Solidago ulmifolia  
 R Teucrium canadense  
Viola sp.  
Vitis riparia  
 +\* Xanthoxylum americanum

Wood Anemone  
 Pusseytoes  
 Common Milkweed  
 Side-Flowering Aster  
 Tall Bellflower  
 Thistle  
 Gray Dogwood  
 American Hazelnut  
 Wild Yam  
 Wild Strawberry  
 Wild Geranium  
 Sharp-Lobed Hepatica  
 Blue Lettuce  
 Prickly Lettuce  
 Wood Nettle  
 Great Blue Lobelia  
 Lion's Foot  
 Bracken Fern  
 Poison Ivy  
 Prickly Wild Gooseberry  
 Common Blackberry  
 Red Raspberry  
 Feathery False Solomon's Seal  
 Old-Field Goldenrod  
 Elm-Leaved Goldenrod  
 Germander  
 Violet  
 Riverbank Grape  
 Prickly Ash

#### Rare at Site:

Actaea alba  
 +\* Adiantum pedatum  
 \* Apocynum androsaemifolium  
Aquilegia canadensis  
 +\* Arisaema triphyllum  
 +\* Celastrus scandens  
 +\* Cornus alternifolia  
 + Eupatorium purpureum  
Euphorbia corollata  
Heuchera richardsonii  
 +\* Hystrix patula

White Baneberry  
 Maidenhair Fern  
 Spreading Dogbane  
 Columbine  
 Jack-in-the-Pulpit  
 Bittersweet  
 Alternate-Leaved Dogwood  
 Purple Joe Pye Weed  
 Flowering Spurge  
 Prairie Alum root  
 Bottlebrush Grass

<u>Menispermum canadense</u>	Moonseed Vine
+* <u>Osmunda claytoniana</u>	Interrupted Fern
* <u>Podophyllum peltatum</u>	Mayapple
<u>Potentilla simplex</u>	Common Cinquefoil
* <u>Rosa</u> sp.	Rose
* <u>Sanguinaria canadensis</u>	Bloodroot
<u>Solidago canadensis</u>	Common Goldenrod
+* <u>Uvularia grandiflora</u>	Bellwort
E <u>Verbascum thapsis</u>	Common Mullein

\* On list of prevalent groundlayer species of Wisconsin southern dry-mesic forest (Curtis, 1959).

+ Species is modal in Wisconsin southern dry-mesic forest (Curtis, 1959).

R Species is on list of vascular plants of rare or uncertain status in Iowa (Pusateri, 1982).

E Species is exotic (Swink and Wilhelm, 1979).

Table 16  
Species Presence List--Groundlayer Herbs Only  
Area 3 North Unit Oak-Maple Woods: South End

(28 Species)

May 18, 1983

<u>Allium tricoccum</u>	Wild Leek
* <u>Anemone quinquefolia</u>	Wood Anemone
+ <u>Anemonella thalictroides</u>	Rue Anemone
<u>Aquilegia canadensis</u>	Wild Columbine
<u>Arabis canadensis</u>	Sickle Pod
* <u>Aralia nudicaulis</u>	Wild Sarsaparilla
+* <u>Arisaema triphyllum</u>	Jack-in-the-Pulpit
* <u>Caulophyllum thalictroides</u>	Blue Cohosh
<u>Dicentra cucullaria</u>	Dutchman's Breeches
* <u>Galium aparine</u>	Cleavers
+* <u>Geranium maculatum</u>	Wild Geranium
<u>Hepatica acutiloba</u>	Sharp-Lobed Hepatica
R <u>Hydrastis canadensis</u>	Golden Seal
* <u>Hydrophyllum virginianum</u>	Virginia Waterleaf
<u>Mitella diphylla</u>	Bishop's Cap
+ <u>Orchis spectabilis</u>	Showy Orchis
<u>Pedicularis canadensis</u>	Wood Betony
<u>Phlox divaricata</u>	Blue Phlox
+ <u>Polemonium reptans</u>	Jacob's Ladder
+* <u>Ranunculus abortivus</u>	Aborted Buttercup
<u>Ranunculus septentrionalis</u>	Swamp Buttercup
* <u>Sanguinaria canadensis</u>	Bloodroot
<u>Trillium cernuum</u>	Nodding Trillium
+* <u>Uvularia grandiflora</u>	Bellwort
<u>Viola missouriensis</u> (?)	Missouri Violet
* <u>Viola pubescens</u>	Downy Yellow Violet
<u>Viola sororia</u>	Hairy Wood Violet
<u>Zizia aurea</u>	Golden Alexanders

\* On list of prevalent groundlayer species of Wisconsin southern dry-mesic forest (Curtis, 1959).

+ Species is modal in Wisconsin southern dry-mesic forest (Curtis, 1959).

R Species is on list of vascular plants of rare or uncertain status in Iowa (Pusateri, 1982).

the walk-through survey (Table 15), but only two species are prominent--sugar maple and red oak.

The understory sample contained slightly fewer species (46) than the average number of species (50) found by Curtis in his sample of high quality dry-mesic forests, but more than he noted in mesic communities (44) (Howell, 1975). Similarly, our sample contained 22 dry-mesic prevalents (Table 9) and 22 mesic prevalents. As Area 3 is on the mesic end of the dry-mesic forest classification, it is reasonable to consider the site to have a high quality understory composition using Curtis's (1959) community descriptions as a standard of comparison.

The largest trees on the site are sugar maple, red oak, white oak, and basswood (Figure 8). While it appears that sugar maple is reproducing in abundance, given the high numbers of this species in the smaller size classes, the oaks and basswood do not seem to be replacing themselves at a high rate. This is an interesting contrast to Area 2, in which basswood was present in large numbers in the smaller size classes. If this trend continues, Area 3 will in future tend to be even more dominated by sugar maple than it is now. If disturbances occur, opening up portions of the canopy, it is possible that other species will be favored, such as big-toothed aspen.

5. Area 4: South Unit Oak-Maple Woods (Figures 9 and 10; Tables 2, 8, 9, 17, 18, 19 and 20).

- a. General Description

The South Unit is characterized by large expanses of forest dominated by Acer saccharum (sugar maple) and Quercus borealis (red oak). Large white oak trees (Quercus alba) are also common on portions of the site

together with shagbark hickory (Carya ovata). The topography is rugged and creates several distinct microclimates. There is a large, steep gully on the west side of the unit which runs north and south and probably acts as a water channel during heavy rains and the spring snow melt. The canopy in this area consists of large, widely-spaced sugar maples which lean out over the gully. The groundlayer contains a profusion of wood nettle (Laportea canadensis). Shrubs, which are nowhere very abundant, are even more scarce in this region. Elsewhere in the South Unit there are several sheltered slopes which have dense patches of ferns, notably interrupted fern (Osmunda claytoniana) and lady fern (Athyrium filix-femina).

Several parts of the forest are dominated by pioneer species such as Populus grandidentata (big-toothed aspen). These sites probably represent areas that were disturbed at some time in the past. The aspens are generally quite large, an indication that the disturbance occurred some time ago. Other regions are dominated by sapling-sized elm (Ulmus americana), black cherry (Prunus serotina), and trembling aspen (Populus tremuloides). It is possible that these areas were more recently disturbed, or that they were first dominated by an herbaceous cover, especially grasses (as might be true of an old pasture, for example).

These changes in canopy composition and in topography lead to different aesthetic experiences in different portions of the forest. The maple and oak-dominated areas create the large room-like spaces described earlier as being characteristic of much of Area 3. The oak and aspen-dominated areas have a much more enclosed feeling, primarily because of the presence of a relatively dense sapling-sized midstory. Depending on the density of the stems in any particular location, the "Gap Areas" range from being semi-open to quite enclosed.

Five groundlayer species of particular interest were found in the South Unit forest. These include three species that have been noted elsewhere at the Monument: Dodecatheon amethystinum (jeweled shooting star), also noted in Area 3; Oryzopsis racemosa (black-seeded rice grass), also found in Areas 2, 3 and 7; and Teucrium canadense (germander), also found in Areas 1 and 3. Two species were not encountered in the other portions of the site. These are Cacalia muhlenbergii (great Indian plantain) and Panax quinquefolius (ginseng). Both are listed by Pusateri (1982) as being either threatened in Iowa or reasonably secure.

#### b. Description of Community Subunits

After our initial site visits in the summer and fall of 1982, we divided the South Unit of the Monument into two major communities--Area 4, the oak-maple woods under discussion in this section of the report, and Area 5, a prairie remnant. Subsequent investigations, however, have led us to make several refinements in these community designations.

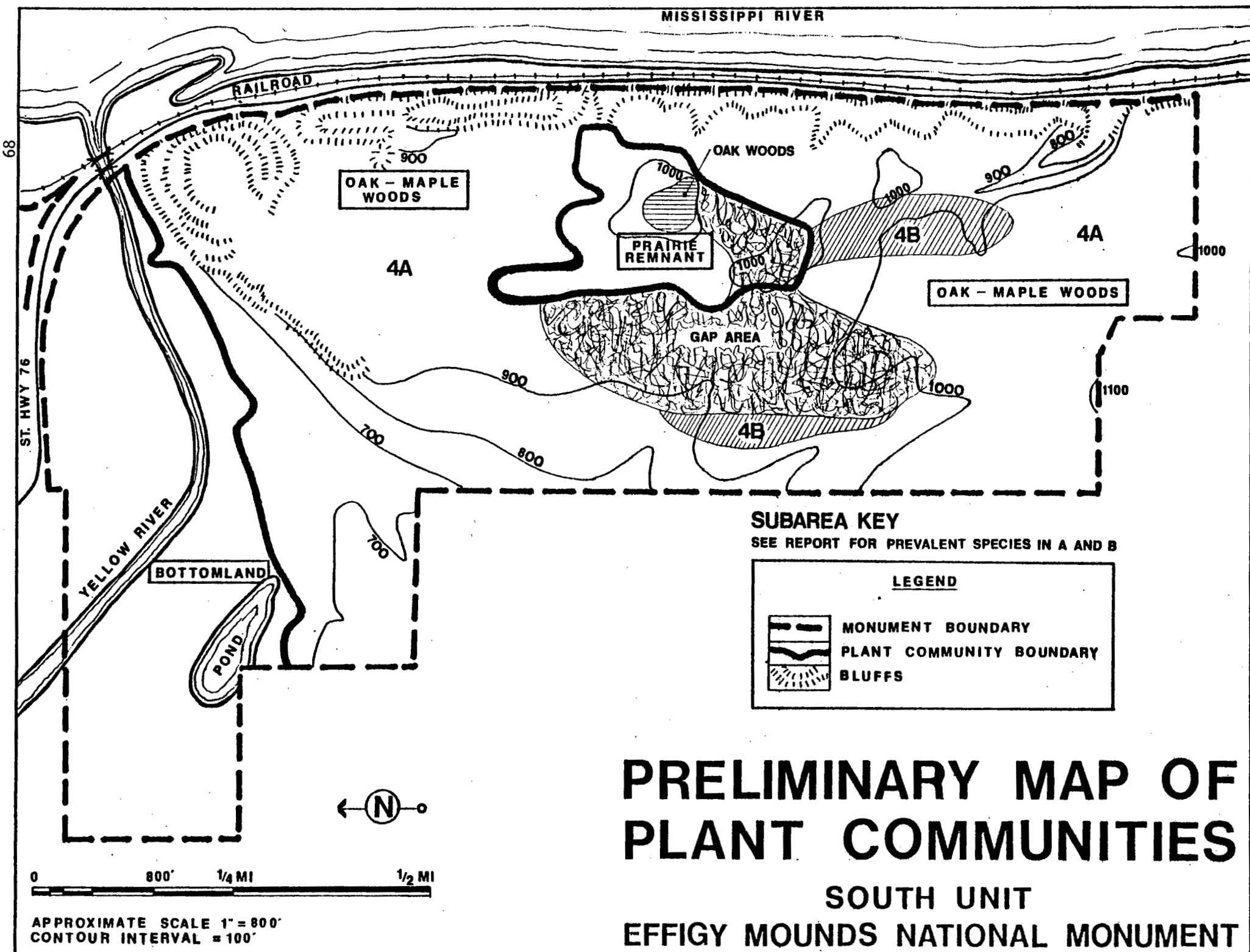
As indicated in Figure 9, Area 4 is now divided into two subunits which have substantial differences in the composition of their canopies. The majority of the site, Subunit A, is dominated by sugar maple, red oak, and basswood (Tilia americana). The two distinct areas designated Subunit B are composed primarily of white oak, big-toothed aspen, trembling aspen, and shagbark hickory (Carya ovata)

We have also identified areas to the south and east of the prairie remnant which are dominated by sapling-sized trees and shrubs. These "Gap Areas" seem to represent former openings which are in various stages of changing to woodland. The eastern portion of the Gap has sapling-sized elm, trembling aspen, and black cherry as well as prickly ash (Xanthoxylum americanum) and

**Figure 9**

**Preliminary Map of Plant Communities**

**South Unit Community Subunits**



hazelnut (Corylus americana). The section immediately south of the prairie remnant is more open with scattered shrubs.

Approximately in the center of the prairie remnant (Area 5) is a small patch of oak woodland.

#### c. Discussion of Field Data

Red oak (I.V. = 20.9) and sugar maple (I.V. = 19.1) are the most prominent canopy species and can be considered co-dominants (Table 17). Both were relatively widespread and present in a range of size classes (Figure 10). Big-toothed aspen, although limited in area (19.4% frequency), was abundant where present, and had a total basal area second only to that of red oak. White oak ranked fourth in number of individuals sampled and in total basal area.

The sapling layer was relatively dense, having approximately 2645 stems per hectare (82 stems in 31, 10m<sup>2</sup> quadrats), and quite diverse with a total of 13 species (Table 18). Eight of the species or 61.5% were also found in the canopy. The most prominent saplings were ironwood (Ostrya virginiana) and sugar maple with Importance Values of 22.4 and 19.2 respectively. Bitternut hickory (Carya cordiformis), red ash (Fraxinus pennsylvanica), and elm were also well represented.

The community had a Continuum Index of 616, making it a dry-mesic forest (Curtis 1959) (Table 2). A total of 72 species were noted in the quadrat samples including 55 shrubs, vines and herbs (Table 2). The community had a relatively low tree density of 371 trees per hectare, but a high total basal area.

Shrubs were not abundant in Area 4 as is noted in Table 8. Although 10 species were encountered in the shrub intercepts, the overall shrub cover estimate was only 7.2%. Cornus racemosa (gray dogwood), Corylus americana

Table 17  
Tree Data Summary  
Area 4 (South Unit Oak-Maple Woods)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importance Value
<u>Acer saccharum</u> (Sugar Maple)	12	26	132.6	18.5	22.6	16.2	19.1
<u>Carya cordiformis</u> (Bitternut Hickory)	1	1	2.4	1.5	0.9	0.3	0.9
<u>Carya ovata</u> (Shagbark Hickory)	7	9	17.9	10.8	7.8	2.2	6.9
<u>Fraxinus americana</u> (White Ash)	1	1	8.0	1.5	0.9	1.0	1.1
<u>Fraxinus pennsylvanica</u> (Red Ash)	4	5	28.4	6.2	4.4	3.5	4.7
<u>Fraxinus pennsylvanica</u> var. <u>anceolata</u> (Green Ash)	2	2	8.8	3.1	1.7	1.1	2.0
<u>Ostrya virginiana</u> (Ironwood)	3	3	4.6	4.6	2.6	0.6	2.6
<u>Populus grandidentata</u> (Big-Toothed Aspen)	6	23	154.1	9.2	20.0	18.9	16.0
<u>Populus tremuloides</u> (Trembling Aspen)	2	3	17.2	3.1	2.6	2.1	2.6
<u>Quercus alba</u> (White Oak)	6	11	98.0	9.2	9.6	12.0	10.3
<u>Quercus borealis</u> (Red Oak)	13	17	227.2	20.0	14.8	27.8	20.9
<u>Tilia americana</u> (Basswood)	3	8	83.5	4.6	7.0	10.2	7.3
<u>Ulmus americana</u> (American Elm)	5	6	34.1	7.7	5.2	4.2	5.7
Totals	65	115	816.8	100	100.1	100.1	100.1

**Figure 10**

**Size Distribution of Important Tree Species**

**Area 4**

**South Unit Oak-Maple Woods**

**AREA 4      SOUTH UNIT      OAK-MAPLE WOODS**

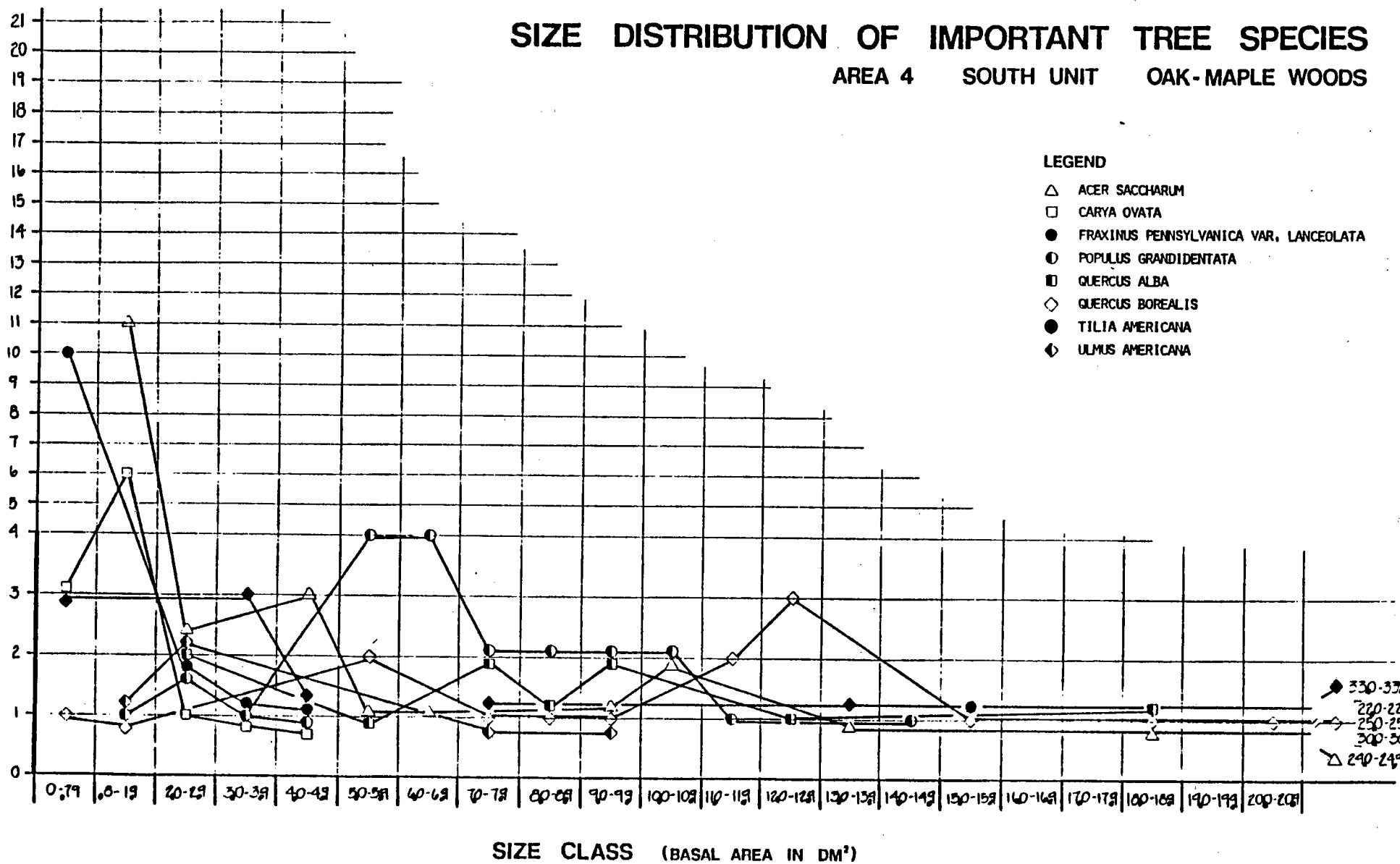
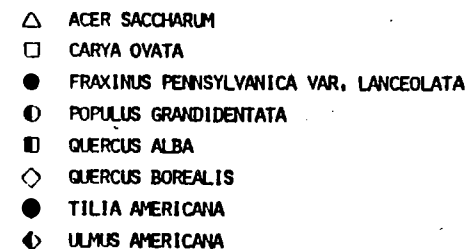


Table 18  
Sapling Data Summary  
Area 4 (South Unit Oak-Maple Woods)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importanc Value
<u>Acer saccharum</u> (Sugar Maple)	8	16	1.971	16.3	19.5	21.7	19.2
<u>Carpinus caroliniana</u> (Blue Beech)	1	3	0.189	2.0	3.7	2.1	2.6
<u>Carya cordiformis</u> (Bitternut Hickory)	9	10	0.782	18.4	12.2	8.6	13.1
<u>Carya ovata</u> (Shagbark Hickory)	2	3	0.104	4.1	3.7	1.1	3.0
<u>Celtis occidentalis</u> (Hackberry)	1	1	0.541	2.0	1.2	6.0	3.1
<u>Fraxinus pennsylvanica</u> (Red Ash)	7	10	1.055	14.3	12.2	11.6	12.7
<u>Fraxinus pennsylvanica</u> var. <u>lanceolata</u> (Green Ash)	1	1	0.255	2.0	1.2	2.8	2.0
<u>Ostrya virginiana</u> (Ironwood)	6	18	2.980	12.2	22.0	32.9	22.4
<u>Prunus serotina</u> (Black Cherry)	1	1	0.003	2.0	1.2	.0	1.1
<u>Prunus virginiana</u> (Choke Cherry)	1	1	0.006	2.0	1.2	0.1	1.1
<u>Quercus borealis</u> (Red Oak)	1	1	0.066	2.0	1.2	0.7	1.3
<u>Tilia americana</u> (Basswood)	3	3	0.139	6.1	3.7	1.5	3.8
<u>Ulmus americana</u> (American Elm)	8	14	0.979	16.3	17.1	10.8	14.7
Totals	49	82	9.070	99.7	100.1	99.9	100.1

(hazelnut), Ribes cynosbati (pasture gooseberry), and Xanthoxylum americanum (prickly ash) were the most dominant species.

The quadrat sample of Area 4 yielded 38 dry-mesic prevalents and 27 species that are modal in that community type (Table 9). Most prominent among these were Parthenocissus quinquefolia (Virginia creeper) and Boehmeria cylindrica (false nettle) (Table 19). Thirteen species of seedlings were encountered with sugar maple (I.V. = 1.4), elm (I.V. = 1.3), and bitternut hickory (Carya cordiformis) (I.V. = 1.0) being the most important (Table 9). No exotics were encountered in the sample.

The results of the walk-through survey are presented in Table 20. This list contains 32 prevalents and 20 modal species. Spring ephemerals do not appear on the species presence list or in the sampling data as the South Unit was not visited at the appropriate time of year.

#### d. Community Analysis

The South Unit Forest is a diverse area the majority of which is a good quality sugar maple-red oak dry-mesic forest. The understory sample contained more species (55) and more prevalents (32) than the average numbers found by Curtis in his studies of high quality dry-mesic forests (50 species, 30 prevalents) (Howell, 1975). Several rare or unusual species add to the interest of the area. Seedlings and saplings are present in abundance. In the sample, sugar maple and green ash (Fraxinus pennsylvanica var. lanceolata) were the most prominent species in the smaller size classes, an indication that these species will continue to be prominent (Figure 10). Red oak was also present in small sizes and will probably continue on site.

As described above, portions of the forest are dominated by white oak, and/or by big-toothed aspen (Figure 9). The understory in these areas was

Table 19  
Fifteen Most Important Understory Herbs, Shrubs, Vines  
Area 4

Species	Importance Value
<u>Parthenocissus quinquefolia</u>	9.4
<u>Boehmeria cylindrica</u>	8.8
<u>Osmorhiza claytoni</u>	6.6
<u>Circaea quadrisulcata</u>	5.8
<u>Laportea canadensis</u>	5.0
<u>Amphicarpa bracteata</u>	4.1
<u>Cryptotaenia canadensis</u>	3.0
<u>Fragaria virginiana</u>	2.6
<u>Carex</u> sp.	2.3
<u>Galium triflorum</u>	2.3
<u>Sanicula gregaria</u>	2.0
<u>Arisaema triphyllum</u>	1.9
<u>Geranium maculatum</u>	1.9
<u>Hepatica acutiloba</u>	1.9
<u>Uvularia grandiflora</u>	1.9

Table 20  
Species Presence List  
South Unit Oak-Maple Woods  
2 October 1982

TREES (16 species)

Common at Site

Acer saccharum  
Prunus serotina  
Quercus alba  
Quercus borealis

Sugar Maple  
Black Cherry  
White Oak  
Red Oak

Intermediate Abundance:

Acer negundo  
Carya cordiformis  
Carya ovata  
Celtis occidentalis  
Fraxinus americana  
Fraxinus pennsylvanica  
Ostrya virginiana  
Populus grandidentata  
Populus tremuloides  
Prunus virginiana  
Ulmus americana

Box Elder  
Bitternut Hickory  
Shagbark Hickory  
Hackberry  
White Ash  
Green Ash  
Hop Hornbeam, Ironwood  
Big-toothed Aspen  
Quaking Aspen  
Choke Cherry  
American Elm

Rare at Site:

Carpinus caroliniana

Blue Beech

Groundlayer (70 species)

Common at Site:

Acalypha rhomboidea  
\* Agrimonia gryposepala  
+\* Amphicarpa bracteata  
Asarum canadense  
Aster laevis  
Aster simplex  
Boehmeria cylindrica  
+\* Carex pensylvanica  
+\* Cryptotaenia canadensis  
\* Desmodium glutinosum  
Galium boreale  
\* Galium triflorum  
+\* Geum canadense  
\* Hydrophyllum virginianum  
Impatiens biflora

Three-Seeded Mercury  
Tall Agrimony  
Hog Peanut  
Wild Ginger  
Smooth Blue Aster  
Panicled Aster  
False Nettle  
Pennsylvania Sedge  
Honestwort  
Pointed Tick Trefoil  
Northern Bedstraw  
Sweet-Scented Bedstraw  
White Avens  
Virginia Waterleaf  
Jewelweed

- Laportea canadensis  
 +\* Osmorhiza claytoni  
Oxalis stricta  
 \* Parthenocissus quinquefolia  
 +\* Ribes cynosbati  
Rubus sp.  
 +\* Sanicula gregaria  
 \* Smilacina racemosa  
 \* Smilax herbacea  
Vitis riparia  
 +\* Xanthoxylum americanum

Wood Nettle  
 Hairy Sweet Cicely  
 Common Wood Sorrel  
 Virginia Creeper  
 Prickly Wild Gooseberry  
 Raspberry  
 Black Snakeroot  
 Feathery False Solomon's Seal  
 Common Carrion Flower  
 Riverbank Grape  
 Prickly Ash

#### Intermediate Abundance:

- +\* Adiantum pedatum  
 \* Anemone quinquefolia  
Campanula americana  
Carex sp.  
Cirsium sp.  
 \* Cornus racemosa  
 \* Corylus americana  
 +\* Dioscorea villosa  
Dryopteris spinulosa  
 + Eupatorium rugosum  
 \* Fragaria virginiana  
 +\* Geranium maculatum  
Helianthus strumosus  
Hepatica acutiloba  
Lysimachia ciliata  
 +\* Prenanthes alba  
 \* Rhus radicans  
Ribes missouriense  
Rudbeckia hirta  
 \* Sambucus canadensis  
Sicyos angulatus  
Solidago nemoralis  
Solidago ulmifolia  
 +\* Thalictrum dioicum  
 +\* Uvularia grandiflora  
Viola sp. #1 (large leaves)  
Viola sp. #2 (small leaves)  
Vitis aestivalis

Maidenhair Fern  
 Wood Anemone  
 Tall Bellflower  
 Sedge  
 Thistle  
 Gray Dogwood  
 American Hazelnut  
 Wild Yam  
 Shield Fern  
 White Snakeroot  
 Wild Strawberry  
 Wild Geranium  
 Pale-Leaved Sunflower  
 Sharp-Lobed Hepatica  
 Fringed Loosestrife  
 Lion's Foot  
 Poison Ivy  
 Wild Gooseberry  
 Black-Eyed Susan  
 Elderberry  
 Bur Cucumber  
 Old-Field Goldenrod  
 Elm-Leaved Goldenrod  
 Early Meadow Rue  
 Bellwort  
 Violet  
 Violet  
 Summer Grape

#### Rare at Site:

- Actaea alba  
Aquilegia canadensis  
 +\* Aralia racemosa  
Camptosorus rhizophyllus  
 +\* Cornus alternifolia

White baneberry  
 Columbine  
 Spikenard  
 Walking Fern  
 Alternate-Leaved Dogwood

Cornus rugosa  
Cystopteris bulbifera  
Desmodium nudiflorum  
Dirca palustris  
Heuchera richardsonii  
 +\* Hystrix patula  
Menispermum canadense  
 +\* Osmunda claytoniana  
 \* Sanguinaria canadensis  
 + Scrophularia marilandica  
Viburnum dentatum

Round-Leaved Dogwood  
 Bladder Fern  
 Bare Stemmed Tick Trefoil  
 Leatherwood  
 Prairie Alum Root  
 Bottlebrush Grass  
 Moonseed Vine  
 Interrupted Fern  
 Bloodroot  
 Late Figwort  
 Southern Arrow-Wood

- \* On list of prevalent groundlayer species of Wisconsin southern dry-mesic forest (Curtis, 1959).
- + Species is modal in Wisconsin southern dry-mesic forest (Curtis, 1959).

largely similar to that in the remainder of the area. Shagbark hickory was the most abundant sapling species in these areas.

6. Area 7: North Unit Aspen Woods (Figures 6 and 11; Tables 2, 8, 9, 21, 22, 23, 24)

a. General Description

The Aspen Area is the smallest forest community sampled. The canopy can be divided into three distinct size classes, each of which has different proportions of species. The largest trees are almost entirely Populus grandidentata (big-toothed aspen). Medium-sized trees include big-toothed aspen and similar numbers of shagbark hickory (Carya ovata). The small trees include relatively little aspen and instead are dominated by basswood (Tilia americana), with lesser amounts of sugar maple (Acer saccharum). There are many standing dead and fallen aspen.

b. Description of Community Subunits

It was difficult to designate distinct subunits within Area 7, however differences do exist, especially in terms of species proportions. As Figure 6 indicates, the community can be roughly divided into two sections. The north section, Subunit A, is dominated by big-toothed aspen, but also contains an abundance of shagbark hickory and white ash, and some basswood. Subunit B, on the other hand, has an almost solid aspen canopy.

c. Discussion of Field Data

Area 7 is classified as a dry-mesic forest (Table 2). The samples contained a total of 56 species, including 38 vines, shrubs and herbs. The overall tree density, 467 trees per hectare, was the highest of the five forest communities sampled.

Big-toothed aspen was by far the most important tree species with an Importance Value of 39.0 (Table 21). Aspen was wide-spread (frequency = 66.7%, 10 of 15 quadrats) and abundant (relative density = 32.9) and had a large total basal area (relative dominance = 57.7). Shagbark hickory can be considered to be of secondary importance (I.V. = 18.8). Of the rest of the trees in the sample, 9 or 64.3%, are represented by only 1 or 2 individuals.

The majority of the species among the saplings were also found among the trees (Tables 21, 22). Big-toothed aspen, however, was notably absent as a sapling. Ironwood (Ostrya virginiana) was the most important species (I.V. = 35.6) followed by elm (Ulmus americana), sugar maple (Acer saccharum), and basswood (Tilia americana). Overall sapling density was 3933 stems per hectare.

The shrub cover was low (Table 8). Hazelnut (Corylus americana), pagoda dogwood (Cornus alternifolia), blackberry (Rubus allegheniensis), and pasture gooseberry (Ribes cynosbati) shared dominance.

The understory sample contained a relatively small number of seedling species, only one of which, elm, was at all abundant (Table 9). There were 24 dry-mesic prevalents and 20 modal species. Parthenocissus quinquefolia (Virginia creeper) was the most important of these (I.V.=16.2) (Table 23).

Table 24 presents the list of species obtained during our initial walk-through of the woods. The majority of the species considered to be "Common" during the survey (64.7%) were also represented in the quadrat sample. The most interesting exception to this is Teucrium canadense (germander), listed as being of undetermined status in Iowa (Pusateri, 1982).

#### d. Community Analysis

The Aspen Woods is probably undergoing the most rapid change of any of the Monument's forest communities. The existing canopy is dominated

Table 21  
Tree Data Summary  
Area 7 (North Unit Aspen Woods)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importance Value
<u>Acer saccharum</u> (Sugar Maple)	1	1	1.6	2.6	1.4	0.4	1.5
<u>Carya cordiformis</u> (Bitternut Hickory)	1	2	10.3	2.6	2.9	2.7	2.7
<u>Carya ovata</u> (Shagbark Hickory)	7	16	57.9	18.4	22.9	15.0	18.8
<u>Fraxinus americana</u> (White Ash)	3	5	12.8	7.9	7.1	3.3	6.1
<u>Fraxinus pennsylvanica</u> var. <u>lanceolata</u> (Green Ash)	1	1	1.6	2.6	1.4	0.4	1.5
<u>Juglans cinerea</u> (Butternut)	1	1	1.8	2.6	1.4	0.5	1.5
<u>Ostrya virginiana</u> (Ironwood)	5	9	12.8	13.2	12.9	3.3	9.8
<u>Populus grandidentata</u> (Big-Toothed Aspen)	10	23	222.1	26.3	32.9	57.7	39.0
<u>Prunus serotina</u> (Black Cherry)	1	1	0.8	2.6	1.4	0.2	1.4
<u>Quercus alba</u> (White Oak)	1	2	21.0	2.6	2.9	5.5	3.7
<u>Quercus borealis</u> (Red Oak)	1	1	10.5	2.6	1.4	2.7	2.2
<u>Robinia pseudoacacia</u> (Black Locust)	1	1	9.0	2.6	1.4	2.3	2.1
<u>Tilia americana</u> (Basswood)	3	5	18.3	7.9	7.1	4.8	6.6
<u>Ulmus americana</u> (American Elm)	2	2	4.5	5.3	2.9	1.2	3.1
Totals	38	70	385.0	99.8	100	100	100

Table 22  
Sapling Data Summary  
Area 7 (North Unit Aspen Woods)

Species	No. Pts.	No. Trees	Basal Area (dm <sup>2</sup> )	Rel. Freq.	Rel. Dens.	Rel. Do.	Importance Value
<u>Acer negundo</u> (Box Elder)	1	5	0.102	2.7	8.5	1.7	4.3
<u>Acer saccharum</u> (Sugar Maple)	6	9	0.289	16.2	15.3	4.9	12.1
<u>Betula papyrifera</u> (Paper Birch)	1	1	0.724	2.7	1.7	12.3	5.6
<u>Carpinus caroliniana</u> (Blue Beech)	1	1	0.038	2.7	1.7	0.6	1.7
<u>Carya ovata</u> (Shagbark Hickory)	1	2	0.160	2.7	3.4	2.7	2.9
<u>Celtis occidentalis</u> (Hackberry)	1	2	0.044	2.7	3.4	0.7	2.3
<u>Fraxinus americana</u> (White Ash)	1	1	0.181	2.7	1.7	3.1	2.5
<u>Fraxinus pennsylvanica</u> var. <u>lanceolata</u> (Green Ash)	2	2	0.072	5.4	3.4	1.2	3.3
<u>Ostrya virginiana</u> (Ironwood)	10	17	3.000	27.0	28.8	51.1	35.6
<u>Prunus serotina</u> (Black Cherry)	1	1	0.053	2.7	1.7	0.9	1.8
<u>Quercus borealis</u> (Red Oak)	1	1	0.028	2.7	1.7	0.5	1.6
<u>Tilia americana</u> (Basswood)	5	8	0.404	13.5	13.6	6.9	11.3
<u>Ulmus americana</u> (American Elm)	6	9	0.779	16.2	15.3	13.3	14.9
Totals	37	59	5.874	99.9	100.2	99.9	99.9

Table 23  
Fifteen Most Important Understory Herbs, Vines, Shrubs  
Area 7

Species	Importance Value
<u>Parthenocissus quinquefolia</u>	16.2
<u>Osmorhiza claytoni</u>	8.8
<u>Sanicula gregaria</u>	7.9
<u>Boehmeria cylindrica</u>	7.3
<u>Circaea quadrisulcata</u>	6.3
<u>Cryptotaenia canadensis</u>	4.5
<u>Galium boreale</u>	3.5
<u>Amphicarpa bracteata</u>	3.1
<u>Laportea canadensis</u>	3.0
<u>Uvularia grandiflora</u>	2.9
<u>Carex sp.</u>	2.7
<u>Ribes missouriense</u>	2.4
<u>Athyrium filix-femina</u>	1.9
<u>Mitella diphylla</u>	1.9
<u>Impatiens biflora</u>	1.8
<u>Phryma leptostachya</u>	1.8

Table 24  
Species Presence List  
North Unit Aspen Community  
9 October 1982

TREES (10 species)

Common at Site:

Populus grandidentata  
Populus tremuloides

Big-toothed Aspen  
Quaking Aspen

Intermediate Abundance:

Carya ovata  
Fraxinus americana  
Ostrya virginiana  
Prunus serotina  
Quercus alba  
Ulmus rubra

Shagbark Hickory  
White Ash  
Hop Hornbeam, Ironwood  
Black Cherry  
White Oak  
Slippery Elm

Rare at Site:

Betula papyrifera  
Tilia americana

Paper Birch  
American Basswood

GROUND LAYER (36 species)

Common at Site:

Acalypha rhomboidea  
\* Agrimonia gryposepala  
+\* Amphicarpa bracteata  
+\* Circaea quadrisulcata  
+\* Cryptotaenia canadensis  
\* Desmodium glutinosum  
+ Eupatorium rugosum  
\* Hydrophyllum virginianum  
+\* Osmorhiza claytoni  
Oxalis stricta  
\* Parthenocissus quinquefolia  
+\* Phryma leptostachya  
Rhus typhina  
+\* Ribes cynosbati  
+\* Sanicula gregaria  
Solidago canadensis  
R Teucrium canadensis

Three-Sided Mercury  
Tall Agrimony  
Hog Peanut  
Enchanter's Nightshade  
Honestwort  
Pointed Tick Trefoil  
White Snakeroot  
Virginia Waterleaf  
Hairy Sweet Cicely  
Common Wood Sorrel  
Virginia Creeper  
Lopseed  
Staghorn Sumac  
Prickly Wild Gooseberry  
Black Snakeroot  
Common Goldenrod  
Germander

## Intermediate Abundance:

<u>Aster laevis</u>	Smooth Blue Aster
<u>Aster lateriflorus</u>	Side-Flowering Aster
* <u>Cornus racemosa</u>	Gray Dogwood
+* <u>Dioscorea villosa</u>	Wild Yam
+* <u>Geranium maculatum</u>	Wild Geranium
* <u>Helianthus strumosus</u>	Pale-Leaved Sunflower
* <u>Rhus radicans</u>	Poison Ivy
<u>Rhus sp.</u>	Raspberry
* <u>Smilacina racemosa</u>	Feathery False Solomon's Seal
* <u>Smilax herbacea</u>	Common Carrion Flower
<u>Solidago nemoralis</u>	Old-Field Goldenrod
+* <u>Solidago ulmifolia</u>	Elm-Leaved Goldenrod
+* <u>Uvularia grandiflora</u>	Bellwort
E <u>Verbascum thapsis</u>	Common Mullein
<u>Viola sp.</u>	Violet

## Rare at Site:

* <u>Caulophyllum thalictroides</u>	Blue Cohosh
+* <u>Celastrus scandens</u>	Bittersweet
+* <u>Cornus alternifolia</u>	Alternate-Leaved Dogwood
+* <u>Xanthoxylum americanum</u>	Prickly Ash

- \* On list of prevalent groundlayer species of Wisconsin southern dry-mesic forest (Curtis, 1959).
- + Species is modal in Wisconsin southern dry-mesic forest (Curtis, 1959).
- R Species is on list of vascular plants of rare or uncertain status in Iowa (Pusateri, 1982).
- E Species is exotic (Swink and Wilhelm, 1979).

by large big-toothed aspen. Many of these are dying, and appear to be being replaced not by more aspen, but by shagbark hickory, elm, basswood, and sugar maple (Figure 11). If this trend continues, the tree composition will become more and more mesic.

The understory is less diverse than those of the other wooded areas. Whether this is due to the smaller size of this community, leading to a reduction in the variety of microclimates present and hence to a smaller number of species, or to the fact that the area is more disturbed, it is difficult to determine. Aside from the reduced diversity, the Aspen Woods understory is similar to those of the other forests of the Monument. Only three of the 56 species in the understory quadrat sample were unique to this Area: Aster simplex, (panicled aster), Sambucus canadensis (elderberry) and Scrophularia marilandica (figwort). None of these is particularly indicative of a poor quality site.

## 7. Area 5: South Unit Prairie Remnant (Figure 9; Tables 25 and 26)

### a. General Description

The open field area in the South Unit is a mixture of forbs and grasses with scattered, widely-spaced shrubs, saplings, and small trees (Figure 9). Although Eurasian grasses such as smooth brome (Bromus inermis) and Kentucky blue grass (Poa pratensis) are important in the community, native prairie forbs such as New England aster (Aster novae-angliae), wild bergamot (Monarda fistulosa), and stiff goldenrod (Solidago rigida) are relatively abundant, and some clumps of prairie grasses are present. Indian grass (Sorghastrum nutans) appears particularly widespread. The edges of the field have the greatest concentration of woody stems, particularly black cherry (Prunus serotina), trembling aspen (Populus tremuloides), and green ash (Fraxinus pennsylvanica var. lanceolata).

**Figure 11**

**Size Distribution of Important Tree Species  
Area 7  
North Unit Aspen Community**

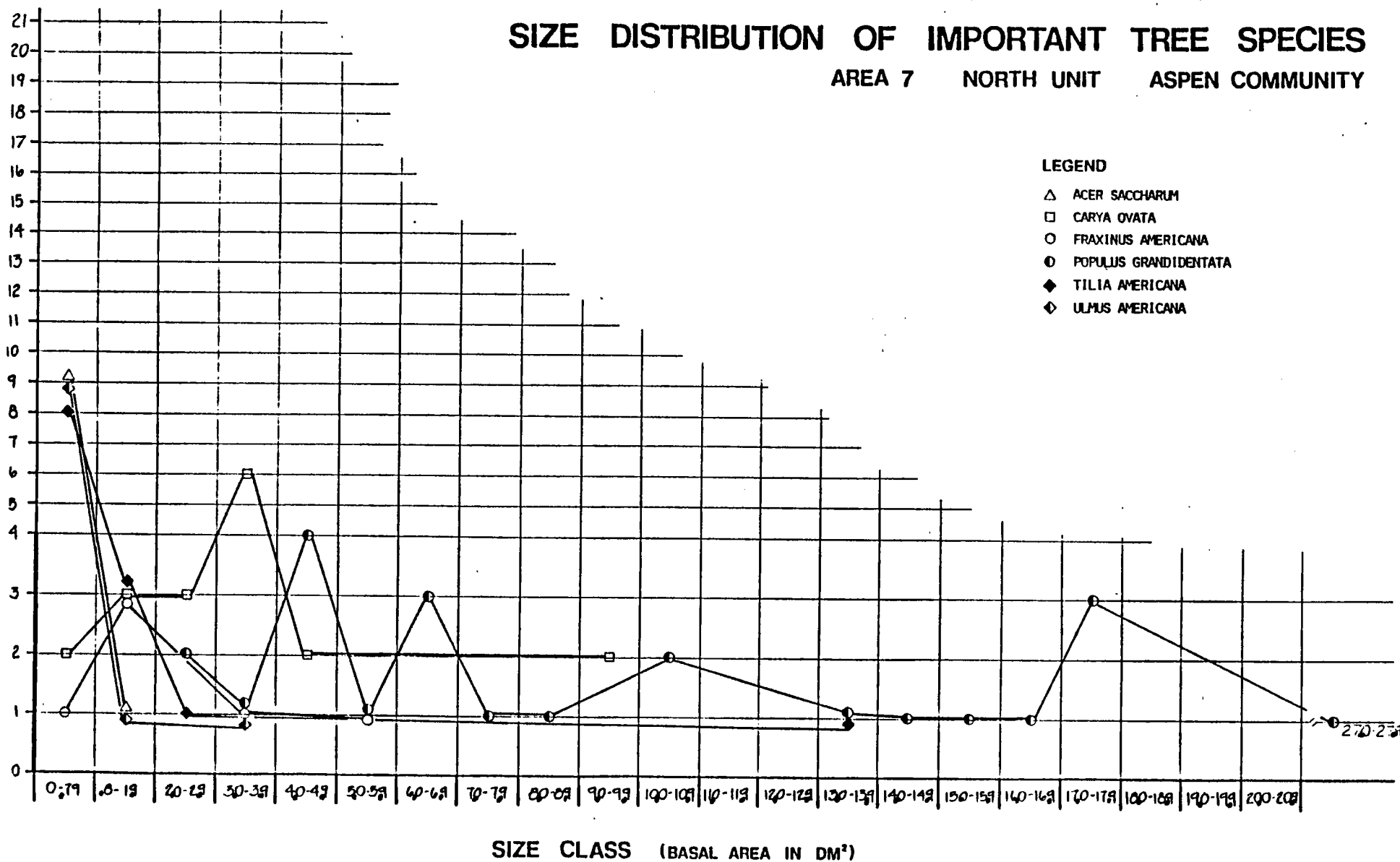
# SIZE DISTRIBUTION OF IMPORTANT TREE SPECIES

AREA 7 NORTH UNIT ASPEN COMMUNITY

NUMBER  
OF  
TREES

## LEGEND

- △ ACER SACCHARUM
- CARYA OVATA
- FRAXINUS AMERICANA
- POPULUS GRANDIDENTATA
- ◆ TILIA AMERICANA
- ◇ ULMUS AMERICANA



Area 5 is very appealing visually. The open expanse provides a pleasing contrast to the more enclosed room-like spaces of the surrounding woods. The scattered saplings and shrubs stand out against the horizontal plane formed by the grasses, and depending on their placement, tend to lead the eye across the opening. The movement of the grasses in the wind is very appealing both to the eye and to the ear.

A diversity of color is present throughout most of the year. One or another forb species is in bloom throughout the growing season. This is particularly nice for the visitor in midsummer, a time when few species are in bloom in the forested areas. The colors are particularly vivid when viewed against the background formed by the grasses. Foliage color is also important. The red of the sumac (Rhus typhina) and the bronze of the Indian grass are striking in the fall.

b. Description of Community Subunits

See the discussion of the subunits of Area 4.

c. Discussion of Field Data

Two sets of field data are available for Area 5: 1. The species presence list compiled during the 1982 survey (Table 25), and 2. Species frequency values compiled from the 1983 quadrat sample (Table 26). A total of 62 species were noted. As both visits to this area occurred in late summer or fall, it is possible that early blooming species were missed.

Of the 44 species included in the quadrat sample, 10 were woody (trees or shrubs) and 7 were grasses or sedges. Seven species were exotics or possible exotics, including Kentucky bluegrass, which had the highest frequency (94%) and therefore can be considered to be the most widespread. Two native species also had high frequencies: Canada goldenrod (Solidago canadensis) (Frequency = 72%) and Indian grass (Frequency = 58%).

Table 25  
Species Presence List  
South Unit Prairie Remnant  
2 October 1982

TREES (6 species)

Intermediate Abundance:

Juniperus virginiana  
Populus tremuloides  
Prunus serotina

Eastern Red Cedar  
Quaking Aspen  
Black Cherry

Rare at Site:

Betula papyrifera  
Crataegus sp.  
Fraxinus americana

Paper Birch  
Hawthorn  
White Ash

GROUND LAYER (33 species)

Common at Site:

Aster novae-angliae  
E Bromus inermis  
Rhus typhina  
Sorghastrum nutans

New England Aster  
Smooth Brome  
Staghorn Sumac  
Indian Grass

Intermediate at Site:

Anemone cylindrica  
Apocynum androsaemifolium  
Asclepias syriaca  
Asclepias verticillata  
Aster laevis  
Aster simplex  
Cirsium discolor  
Erigeron annuus  
Helianthus sp.  
E Hypericum perforatum  
Lespedeza capitata  
Monarda fistulosa  
Rudbeckia hirta  
Solidago canadensis  
Solidago rigida  
Solidago speciosa  
Verbena stricta  
Verbena urticifolia  
Veronicastrum virginicum

Thimbleweed  
Spreading Dogbane  
Common Milkweed  
Whorled Milkweed  
Smooth Blue Aster  
Panicled Aster  
Pasture Thistle  
Annual Fleabane  
Sunflower  
Common St. John's Wort  
Round-Headed Bush Clover  
Wild Bergamot  
Black-Eyed Susan  
Common Goldenrod  
Stiff Goldenrod  
Showy Goldenrod  
Hoary Vervain  
White Vervain  
Culver's Root

## Rare at Site:

Andropogon gerardi  
Andropogon scoparius  
Aster ericoides  
Celastrus scandens  
Desmodium illinoense  
Elymus canadensis  
Gentiana saponaria  
Liatris aspera  
Ratibida pinnata  
Sporobolus heterolepis

Big Bluestem  
Little Bluestem  
Heath Aster  
Bittersweet  
Illinois Tick Trefoil  
Canada Wild Rye  
Soapwort Gentian  
Rough Blazing Star  
Yellow Coneflower  
Prairie Dropseed

E Species is exotic (Swink and Wilhelm, 1979)

Table 26  
Data Summary  
Area 5 (South Unit Prairie Remnant)

Species	Frequency (%)
<u>Achillea millefolium</u> (Yarrow)	6.0
* <u>Agropyron repens</u> (Quack Grass)	4.0
<u>Anemone cylindrica</u> (Thimbleweed)	6.0
<u>Antennaria neglecta</u> (Pussey Toes)	10.0
<u>Apocynum androsaemifolium</u> (Spreading Dogbane)	2.0
<u>Asclepias verticillata</u> (Whorled Milkweed)	22.0
<u>Aster drummondii</u>	30.0
<u>Aster ericoides</u> (Heath Aster)	36.0
* <u>Bromus inermis</u> (Smooth Brome)	54.0
<u>Carex muhlenbergii</u> (Sand Sedge)	8.0
* <u>Chenopodium album</u> (Lamb's Quarters)	2.0
(*) <u>Convolvulus sepium</u> (Hedge Bindweed)	2.0
<u>Cornus racemosa</u> (Gray Dogwood)	6.0
<u>Crataegus</u> sp. (Hawthorn)	2.0
<u>Desmodium glabellum</u>	4.0
<u>Erigeron</u> sp. (Fleabane)	18.0
<u>Fraxinus americana</u> (White Ash)	2.0
<u>Fraxinus pennsylvanica</u> (Red Ash)	6.0
<u>Fraxinus pennsylvanica</u> var <u>lanceolata</u> (Green Ash)	8.0
<u>Helianthus giganteus</u> (Tall Sunflower)	4.0
<u>Juniperus virginiana</u> (Red Cedar)	2.0
<u>Lespedeza capitata</u> (Round-Headed Bush Clover)	20.0

Table continued

Species	Frequency (%)
<u>Liatris aspera</u> (Rough Blazing Star)	6.0
<u>Monarda fistulosa</u> (Wild Bergamot)	34.0
<u>Panicum dichotomiflorum</u> (Knee Grass)	34.0
<u>Physalis pubescens</u> (Hairy Ground Cherry)	2.0
* <u>Poa pratensis</u> (Kentucky Blue Grass)	94.0
<u>Potentilla simplex</u> (Common Cinquefoil)	2.0
(*) <u>Prunella vulgaris</u> (Self-Heal)	2.0
<u>Prunus serotina</u> (Black Cherry)	4.0
<u>Ratibida pinnata</u> (Yellow Coneflower)	2.0
<u>Rhus typhina</u> (Staghorn Sumac)	8.0
<u>Rubus allegheniensis</u> (Common Blackberry)	16.0
<u>Scutellaria</u> sp. (Skullcap)	4.0
<u>Solidago canadensis</u> (Canada Goldenrod)	72.0
<u>Solidago nemoralis</u> (Dyer's Weed)	14.0
<u>Solidago rigida</u> (Stiff Goldenrod)	44.0
<u>Solidago speciosa</u> (Showy Goldenrod)	6.0
<u>Sorghastrum nutans</u> (Indian Grass)	58.0
<u>Sporobolus cryptandrus</u> (Sand Dropseed)	2.0
* <u>Trifolium pratense</u> (Red Clover)	6.0
<u>Ulmus americana</u> (American Elm)	2.0
<u>Verbena stricta</u> (Hoary Vervain)	2.0
<u>Veronicastrum virginicum</u> (Culver's Root)	2.0

Table Continued

Species	Frequency (%)
<u>Vitis riparia</u> (Riverbank Grape)	6.0
Unknown Grasses	10.0
Unknown Forbs	6.0

\* Exotic (Swink and Wilhelm, 1979)

(\*) May Be Native or Exotic (Swink and Wilhelm, 1979)

#### d. Community Analysis

The South Unit Prairie Remnant can not be considered a good quality native community; however, it does have a good diversity of prairie species. The fact that it has an increasing density of saplings at the edges is an indication that the site may be reverting to forest. It is difficult to predict how rapidly such a change might occur without further study of the past and current spreading rates of the woody species.

### 8. Area 6: North Unit Old Field (Figure 6; Tables 27 and 28)

#### a. General Description

The open field portion of the North Unit is generally not of botanical interest. It is dominated by Eurasian grasses, particularly smooth brome (Bromus inermis), and lacks the prairie grasses and the general abundance of prairie forbs which enhance the South Unit opening (Area 5). The open, treeless character of the southern portion of the area (Figure 6) is however very important to the aesthetic experience of the North Unit. The opening is visible from the hiking trail, and provides the visitor with a diversity of views. The sudden change from closed canopy forest to an open panorama with rolling topography is dramatic and stimulating. The community can be very colorful, especially in the fall when the numerous species of asters and goldenrods found in the area are in bloom.

#### b. Description of Community Subunits

The northeastern section of Area 6, designated Subunit A (Figure 6) contains saplings and shrubs at various densities within the brome grass. Most prominent among the woody plants are Ulmus rubra (slippery elm) and Juniperus virginiana (eastern red cedar). The density of these species increases from west to east.

The majority of the community, Subunit B, has a low density of woody stems. The area is dominated by brome grass with large patches of Solidago rigida (Stiff goldenrod) and S. canadensis (Canada goldenrod). Shrubs are generally sparse except along the west fenceline.

#### c. Discussion of Field Data

Tables 27 and 28 summarize the botanical composition of Area 6. Thirty-five species were noted in the walk-through survey (Table 27) and 26 in the quadrat sample (Table 28). Together, the lists contain a total of 49 species.

Six of the species in the quadrat sample were exotics or possible exotics (Swink and Wilhelm, 1979), including the two species with the highest frequencies. Poa pratensis (Kentucky bluegrass) had a frequency value of 98% which means it was found at all but one of the sample points. Brome grass was almost as widespread with a frequency of 94%. Canada goldenrod was the most frequent forb species (Frequency = 52.0%). Only two woody species were found in the sample, slippery elm and Rubus allegheniensis (common blackberry).

#### d. Community Analysis

The North Unit Old Field bears the least resemblance to native vegetation of any community at the Monument. Although native species do occur, they are a minor component. The site is of aesthetic value, however, because of its open character.

The fact that saplings and small trees are found on a portion of the old field may indicate that with time the site will become forested. The rate at which this conversion will occur is difficult to predict.

#### E. Overall Vegetation Analysis

The major woodland communities of the Monument (Areas 1, 2, 3, 4, and 7) are good quality representatives of dry-mesic and wet-mesic forests. Their

Table 27  
Species Presence List  
North Unit Old Field  
9 October 1982

TREES (6 species)

Intermediate Abundance:

Acer negundo  
Fraxinus americana  
Juniperus virginiana  
Prunus serotina  
Ulmus americana

Box Elder  
White Ash  
Eastern Red Cedar  
Black Cherry  
American Elm

Rare at Site:

Crataegus sp.

Hawthorn

GROUNDLAYER (29 species)

Common at Site:

E Bromus inermis  
E Daucus carota  
Erigeron annuus  
E Phleum pratense  
Solidago canadensis

Smooth Brome  
Queen Anne's Lace  
Annual Fleabane  
Timothy  
Common Goldenrod

Intermediate Abundance:

Apocynum androsaemifolium  
Asclepias syriaca  
Aster novae-angliae  
Aster simplex  
Cirsium discolor  
(E) Convolvulus sepium  
Oenothera biennis  
E Plantago major  
Rubus sp.  
Rudbeckia hirta  
E Rumex crispus  
Solidago rigida  
Solidago ulmifolia  
R Teucrium canadense  
Verbena urticifolia  
Veronicastrum virginicum  
Vitis riparia

Spreading Dogbane  
Common Milkweed  
New England Aster  
Panicled Aster  
Pasture Thistle  
Hedge Bindweed  
Common Evening Primrose  
Common Plantain  
Raspberry  
Black-Eyed Susan  
Curly Dock  
Stiff Goldenrod  
Elm-Leaved Goldenrod  
Germander  
White Vervain  
Culver's Root  
Riverbank Grape

## Rare at Site:

<u>Anemone cylindrica</u>	Thimbleweed
<u>Aster ericoides</u>	Heath Aster
<u>Gentiana saponaria</u>	Soapwort Gentian
<u>Lactuca floridana</u>	Blue Lettuce
<u>Monarda fistulosa</u>	Wild Bergamot
E <u>Trifolium pratense</u>	Red Clover
<u>Urtica dioica</u>	Stinging Nettle

E Species is exotic (Swink and Wilhelm, 1979)

(E) May be native or exotic (Swink and Wilhelm, 1979)

R Species is on list of vascular plants of rare or uncertain status in Iowa  
(Pulasteri, 1982)

Table 28  
Data Summary  
Area 6 (North Unit Old Field)

Species	Frequency (%)
<u>*Agropyron repens</u> (Quack Grass)	2.0
<u>Antennaria neglecta</u> (Pussey Toes)	2.0
<u>Asclepias verticillata</u> (Whorled Milkweed)	2.0
<u>Aster ericoides</u> (Heath Aster)	4.0
<u>Aster lateriflorus</u> (Side-Flowering Aster)	2.0
<u>*Bromus inermis</u> (Smooth Brome)	94.0
<u>Carex</u> sp. (Sedge)	8.0
<u>(*)Convolvulus sepium</u> (Hedge Bindweed)	14.0
<u>*Daucus carota</u> (Queen Anne's Lace)	16.0
<u>Erigeron</u> sp. (Fleabane)	6.0
<u>*Lactuca scariola</u> (Prickly Lettuce)	2.0
<u>Monarda fistulosa</u> (Wild Bergamot)	16.0
<u>Orchis spectabilis</u> (Showy Orchis)	2.0
<u>Panicum dichotomiflorum</u> (Knee Grass)	14.0
<u>Parthenocissus quinquefolia</u> (Virginia Creeper)	8.0
<u>Physalis heterophylla</u> (Ground Cherry)	2.0
<u>*Poa pratensis</u> (Kentucky Blue Grass)	98.0
<u>Rhus radicans</u> (Poison Ivy)	6.0
<u>Rubus allegheniensis</u> (Common Blackberry)	10.0
<u>Solidago canadensis</u> (Canada Goldenrod)	52.0
<u>Solidago nemoralis</u> (Dyer's Weed)	6.0

Table Continued

Species	Frequency (%)
<u>Solidago rigida</u> (Stiff Goldenrod)	10.0
R <u>Teucrium canadense</u> (Germander)	6.0
<u>Ulmus rubra</u> (Slippery Elm)	6.0
<u>Veronicastrum virginicum</u> (Culver's Root)	2.0
<u>Vitis riparia</u> (Riverbank Grape)	8.0
Unknown Forbs	2.0

\* Exotic (Swink and Wilhelm, 1979)

(\*) May Be Native or Exotic (Swink and Wilhelm, 1979)

R species is on list of vascular plants of rare or uncertain status in Iowa (Pusateri, 1982)

compositions compare favorably with the descriptions given by Curtis (1959) for presettlement forest communities in southern Wisconsin. The areas are diverse with few signs of recent disturbance, although the presence of old field areas in both the North and South Units are obvious reminders of past farming activities, and the canopy compositions appear to indicate that much of the forest is second growth. The presence of large aspen trees and the relative sizes of oak and maple are important with regard to the latter observation.

With the exception of the old field areas and of the areas in the immediate vicinity of the path system, very few exotic species occur. On the other hand, several species of special interest are present. Although we did not find any federally endangered species in our vegetation sample, we did find species of concern to Iowa (Pusateri, 1982). These include: 1. swamp loosestrife (Decodon verticillatus), listed as threatened throughout its range or critically endangered in Iowa; 2. jeweled shooting star (Dodecatheon amethystinum), listed as being endangered in Iowa; 3. black-seeded rice grass (Oryzopsis racemosa), putty root orchid (Aplectrum hyemale), golden seal (Hydrastis canadensis), yellow lady's slipper (Cypripedium calceolus var. pubescens), and possibly rough bedstraw (Galium asprellum), all listed as being threatened in Iowa; 4. Indian plantain (Cacalia muhlenbergii) and ginseng (Panax quinquefolius), both either threatened in Iowa or apparently secure but otherwise of special interest; and 5. germander (Teucrium canadense), listed as being of undetermined status in Iowa. In addition several other uncommon species were present such as Orchis spectabilis (showy orchid), Polemonium reptans (Jacob's ladder), and Mitella diphylla (Bishop's cap).

Tree reproduction is occurring on all sites with a tendency in the dry-mesic forest areas for species of the sapling layer to be more shade tolerant than the existing mature trees. With the exception of the aspen woods, the tree composition of the existing canopies appears to be changing relatively slowly. The open, old field areas also contain different densities of tree saplings. Whether these areas will become forests in the absence of management or disturbance is open to question, but indications are that this change will occur in time.

The diversity of communities and dramatic topographic changes combine to make hiking the Monument trails a very interesting experience. The spatial character changes dramatically as the visitor moves from maple woods to old field to rock outcrop. Similar contrasts occur because of the diverse complement of species in the communities.

Although some erosion is occurring along the trail system with some resultant damage to the vegetation, the problem is not yet a major one and should be correctible.

### 3. Preparation of Maps

In addition to making the small vegetation maps which are included as Figures in this report, we prepared three maps of the Monument at a scale of 1" = 600' (1 cm = 72 m). These can be used alone, or combined as overlays. The maps include: 1. a Base Map showing the Monument boundaries, the major roads on the site, the location of bluffs and rock outcrops, and the configuration of the topography, depicted as two-foot (0.61m) contours; 2. a Plant Community Survey Map showing vegetation communities, the locations of the permanent sampling transects, and the positions along the transects at

which unusual or interesting plant species were observed; and 3. a Mounds and Natural Features Map.

We used several sources in drafting the maps in addition to our own observations and measurements. These included the following documents which are on file at the Effigy Mounds National Monument Headquarters:

NM EFF 3021

NM EFF 3026

NM EM 7102

NM EFF 5003 (8-1/2" x 11" Reduction) (used for location of trail in South Unit)

394 8003 Land Use Plan

Brochure 6PO 1982-361-609/181 Reprint in 1973

The maps were drawn with ink and pencil on mylar and are fitted with tabs so that they can be registered when used as overlays.

#### 4. Early Vegetation of the Monument

Our investigations into the nature of the vegetation of the Monument at the time of the mound-building activities have not proven to be particularly fruitful. Information from archeological, anthropological, and paleobotanical sources is sketchy and contradictory. Our analysis has not been particularly helpful in determining management directions. Information supplied to us by the Monument indicates that the vegetation at the time of the mound-building culture was maple-basswood forest. We have been unable to adequately confirm or deny this observation.

Despite repeated contacts, we were not able to secure the original federal land survey records from the State Archives of Iowa during the course of this project. This information is important in understanding the vegetation as it would have appeared in the early 1800s, prior to intense European settlement

of the region. Although the vegetation would have been altered even at that time by the activities of the mound-builders as well as by other Native Americans and by early European settlers, the land survey records give us the best information available on the "natural" condition of vegetation. Although other investigators have published their analyses of the Iowa Land Survey, it is important to come to our own conclusions. Only recently we have been able to obtain a copy of the land survey on microfiche. Greg Moore will be analyzing the information and it will be available as part of his Master's Thesis. 7

The Driftless Area has been the subject of botanical investigations since the late 1800s. Studies such as those by MacBride (1894), Shimeck (1904), Tolstead (1938) and Hartly (1957) can be used to gain a general understanding of the flora of this part of Iowa. At least two studies have used surveyors records in a qualitative way. Trewartha (1940) used generalized data to map the presettlement vegetation. He located four forest types in the vicinity of Effigy Mounds: 1. Oak (thin stand); 2. Oak (denser stand), 3. Oak, Hickory; and 4. Riverbottom Woodlands. Dick-Peddie (1953) attempted to compare the presettlement vegetation with that of the 1950s. He concluded that forests in Allamakee County had increased over the time period studied.

A more recent study by Kline (1976) dealt specifically with quantitative descriptions of presettlement vegetation in the Kickapoo River Valley, located in southwestern Wisconsin within the Driftless Region. She identified several communities which comprised the majority of the vegetation. These included white oak dominated woodlands, oak savanna, and sugar maple forests. The distribution of these communities varied in response to changes in topography and to differing climatic regimes within her study area.

Kline also compared current (mid 1970s) vegetation with that of presettlement times. She found that the most conspicuous changes have been a nearly complete elimination of white oak woodlands from the level uplands because of agricultural activities and the disappearance of savanna, largely because of fire control and consequent forest growth. Her evidence also showed that timber harvest has changed the composition of mesic forests in the area such that red oak is more prominent now than in presettlement times. This activity has had little effect on the composition of more xeric forests.

Information available to us from the Park Service regarding the presettlement vegetation of the Effigy Mounds area indicates that there was a preponderance of maple-basswood forest with scattered prairie on south-facing hillsides and rocky bluffs. This would match the description of the mesic woodlands described by Kline (1976).

## 5. Management Recommendations

### A. Introduction

Our discussions with park personnel have identified four main goals for the management of the vegetation of Effigy Mounds. These concern:

- 1) The integrity of the mounds and especially of their soil structure,
- 2) The preservation of the majority of the vegetation in a "natural" condition, with particular attention to rare and/or endangered plant and animal species,
- 3) Visitor education, with an emphasis on enhancing an understanding of the mound-building culture and of the natural environment, and
- 4) Visitor enjoyment, with an emphasis on the aesthetics of plant communities and on the scenic vistas overlooking the Mississippi River.

These goals are not mutually exclusive, and can be met using more than one management approach.

The discussion that follows is divided into three major sections. First we will consider the management of the mounds, second that of the existing woodland areas, and third that of the existing open areas. This organization follows that of the original Scope of Work document and also represents three different sets of management criteria. Within each section, we will provide a series of alternatives as well as specific recommendations.

In general, we recommend that the Monument be managed so as to provide a variety of plant communities, most of which should be representative of different types of presettlement vegetation. These should include several open communities interspersed among more enclosed forested areas. Such an arrangement is well-suited to the present conditions of the site and meets the requirements of Goals 2, 3, and 4. In addition, we suggest that several techniques be tried in managing the vegetation on the burial mounds. As little research appears to have been done regarding this problem, it is perhaps best not to manage all of the mounds in the same way in case the chosen technique proves to be ineffective.

## B. Vegetation Management on Burial Mounds

### 1. Introduction

As described in the Scope of Work, there are two important considerations in the management of the vegetation on the mounds: 1. to prevent soil displacement (Goal 1) and 2. to identify the mounds as mounds for interpretation to the public (Goal 3).

Several factors may contribute to soil displacement. These include: the erosive effects of wind and water, the growth of roots through the soil and their subsequent decay, the uprooting of trees such that the roots carry soil with them, and the activities of burrowing animals. Most types of vegetative cover help to prevent erosion, both by intercepting precipitation with leaves

and branches and thereby slowing the velocity of runoff, and by holding soil particles with roots.

Of the other factors, tree uprooting and burrowing animals appear to be the most serious (Motivans, 1984a). Roots in and of themselves do not particularly disrupt soil stratigraphy or buried artifacts (Motivans 1984b). At this point, not much has been documented with regard to what vegetation conditions do or do not promote animal activities. Bill Green, Staff Archeologist with the Wisconsin State Historical Society, has noticed animal burrows on both grass-covered and wooded mounds (Motivans, 1984a). In order to identify the mounds for the public it is helpful to emphasize their form in relationship to that of their surroundings.

## 2. Management Alternatives

With these comments in mind, we propose the following management strategies:

### a. Mown lawn

Current vegetation management policies include having mounds and the area immediately surrounding them covered with turf. This approach has the advantage of providing good erosion control with relatively shallow root penetration, hence soil disruption is slight. It also is effective at making the form of the mounds very discernible, as they appear to rise-up out of their flat, open surroundings.

On the other hand, lawn does require periodic mowing to retain its advantages with regard to emphasizing the forms of the mounds and to help prevent the invasion of undesired species. This approach also requires that the area around the mounds be cleared of canopy to provide enough light for growth of the grasses. Lawn presumably is not particularly representative of

"natural" conditions and in some ways disrupts the "spiritual essence" of the burial site for the visitors.

b. Natural ground cover - Pussy toes, Antennaria neglecta

Antennaria neglecta is a low-growing native herbaceous species which can grow in full sun or partial shade. It is already present on the site and thus is presumably suited to the area. An alternative which might be pursued on an experimental basis would be to use this species to provide cover. Advantages of this approach include the fact that pussy toes requires no mowing. In addition, if the areas around the mounds are kept as lawn, the color and textural contrasts between the pussy toes and the lawn grasses further accentuates the forms of the mounds. Pussy toes are shallow-rooted and do not in themselves disrupt the soil. The suspected allelopathic effects of this species might inhibit the growth of woody species, hence further protecting the soil stratigraphy by minimizing tree fall problems. Pussy toes also has a connection to some Native American cultures. It was used as a type of tobacco, both for chewing (roots and leaves) and for smoking (dried leaves and blossoms)(Motivans, 1984b).

A major disadvantage of this approach is the fact that, to our knowledge, no one has tried to propagate and/or encourage the growth of Antennaria. There are no established procedures upon which to rely. Some suggested approaches include: transplanting of small pieces from existing Antennaria mats, direct seeding, or transplanting of individual plants from propagation beds.

c. Natural ground cover - woodland understory

According to the Scope of Work document for this project, it is theorized that prior to lumbering operations in the twentieth century, the mounds were in wooded areas and covered with shade-tolerant groundlayer

species but without trees growing directly on them. Whether or not this was actually the case such a vegetation cover is appropriate at least in terms of protecting the soil. Herbaceous woodland plants coupled with a good canopy cover minimize erosion, and the majority of the species are relatively shallow-rooted. Groundlayer species can be allowed to appear naturally or they can be selectively planted. Species which might be particularly considered include Asarum canadense (wild ginger), Fragaria virginiana (wild strawberry), Galium sp. (Bedstraw), Carex sp (sedges), and Parthenocissus quinquefolia (Virginia Creeper). All are found in the woodlands at Effigy Mounds. These species can grow to form large mats which cover the soil surface. Leaf litter can be allowed to remain. Tree seedlings should be removed if they should start to establish in the mounds. In this way damage from tree falls can be minimized. Although the shape of the mounds may not be quite so obvious in a wooded situation as it is under the first two approaches, visibility can be enhanced where desired by maintaining a relatively open middlestory in the surrounding area. As most of the wooded areas at Effigy Mounds already have dense canopy covers, shrubs and tall herbs are generally scarce. If middlestory species become a problem, they can be actively removed. This approach also has the advantage of coming closer to what is presumed to be the condition of the vegetation at the time the mounds were created.

### 3. Strategy of Choice

We recommend that all three strategies be employed at different Effigy Mounds locations. Each has unique advantages and disadvantages, and all three presumably protect the mound stratigraphy. Alternative a, the mown lawn, is the least appealing from the standpoint of a naturalistic approach to vegetation management, but it is an established tradition (and hence somewhat

expected by the public) and does appear to protect the mounds. Alternative b, pussy toes cover, is an interesting experimental approach which could be pursued in limited areas, at least at first, and not those visited by the public. Along the same lines, other open area ground cover species could also be tried, including, perhaps various prairie species. The prairie grasses and forbs are an excellent erosion control, and although the plants often have extensive root systems, these should not be too disruptive with regard to the mound stratigraphy. Alternative c, woodland understory, is in many ways the best alternative in that it requires relatively little management and presumably is the type of cover that has preserved the mounds to the present. This will work well in the currently forested mound sites, but would require some time to implement in the areas which are currently free of tree canopy. If this approach is desired on some of the open sites, the first step would be to establish shade-producing tree species in the vicinity of the mounds. Depending on location, oaks, maples, basswoods, and/or hickories would be reasonable choices. Once the canopy begins to be established, native groundlayer can be introduced, starting with species which grow well in semi-open canopy, such as Fragaria virginiana (wild strawberry), and with time moving toward more shade-tolerant plants such as Asarum canadense (wild ginger).

#### C. Management of Existing Woodlands (Areas 1, 2, 3, 4 and 7)

##### 1. Introduction

Management of the woodland areas of the Monument is particularly concerned with meeting Goals 2, 3 and 4 above. In general, this involves keeping the areas as natural as possible and providing for a diversity of botanical and aesthetic experiences. In addition, the several rare and unique

plant species found in the wooded areas -- Decodon verticillatus, Dodecatheon amethystinum, Oryzopsis racemosa, Aplectrum hyemale, Hydrastis canadensis, Cypripedium calceolus var. pubescens, Cacalia muhlenbergii, Panax quinquefolius, Teucrium canadense, and Orchis spectabilis -- are deserving of special attention.

## 2. Management Alternatives

### a. Hands-off except for vegetation monitoring

Given a continuation of current use-levels, no active management is necessary to maintain good quality, natural forest communities. The areas are diverse and, as discussed previously, they compare favorably with the structure and composition of presettlement Wisconsin communities as described by Curtis (1959). There appear to be few problems with invasive pest species, either native or exotic. With time, the upland vegetation will tend to be more dominated by mesic species than it is at present; the Sny Magill Bottomlands will change periodically, but will remain similar in composition in the long run, given no change in the current river cycles. These trends, if followed, will result in natural, good quality communities.

The sites should be monitored on a regular basis to keep track of changes in structure and composition. Rare species should be mapped and their populations estimated on a regular basis, perhaps as often as every two to three years. In this way it can be determined whether or not the species are maintaining themselves. At present it is difficult to know their long-term status. It is important to make such observations over a series of years before coming to firm conclusions, as populations may fluctuate naturally from year to year. Without demographic information of this type, it is difficult to justify any but a hands-off management approach.

Each site should be visited at least once every year and checked for the presence of pest species, outbreaks of disease, etc. If highly invasive species are discovered (Eurasian honeysuckle, Lonicera x-bella, buckthorn, Rhamnus cathartica, for example) they should be removed as soon as possible. Disease or insect pest outbreaks can either be controlled or left alone depending on criteria such as whether or not the pathogens are native or exotic, the rapidity of their spread, and/or their potential for forest devastation.

A quantitative vegetation sample should be conducted every 5 to 10 years in order to better understand successional trends. This can proceed using the permanent sampling stations established in all of the wooded areas of the Monument except Area 7. An alternative approach would be to use a different set of randomly chosen sampling points for every survey. The advantage to this second approach and the major disadvantage of the first one is that the loss of permanent sampling point markers through vandalism or due to natural causes will not affect the results of the random survey, whereas it would seriously affect those of the other approach.

b. Management for forest diversity

As stated above, with time the upland forest communities will tend to be dominated by more mesic species with the result that some of the present canopy diversity may well be lost. Some diversity may be desirable for educational and/or aesthetic purposes. The groundlayer associated with different tree canopies may vary, especially if the degree of shade provided varies. The aesthetic characteristics also differ with different species.

If continued or greater community diversity is desired, this can be achieved in two ways:

- 1) Cut portions of the Aspen Woods to regenerate aspen. This can be done as clearcuts of various sizes and shapes and can be repeated on a 30 to 40 year cycle. Without such an approach and barring a natural disaster such as a fire or a windstorm, large expanses of aspen may eventually be lost from the site.
- 2) Allow portions of the existing open areas to fill in with woody materials. In the short run, this will provide forest diversity, but it will also reduce the amount of open space at the Monument.

### 3. Strategy of Choice.

We recommend that the first alternative management strategy, including the monitoring procedures, be followed. If more canopy diversity should be desired, we recommend cutting portions of the existing aspen woods rather than allowing the open areas to fill in.

## D. Management of Existing Open Areas (Areas 5 and 6)

### 1. Introduction

In order to provide visitors with a diversity of experiences we recommend that at least some portion of the Monument be maintained as open areas free of an extensive tree canopy. In theory this could be achieved by creating and maintaining new open areas within the existing tree canopy while allowing the current openings to become re-forested. Although such a practice would enable a designer to locate the openings in the "optimal locations", it is perhaps least destructive to work instead with the existing sites.

### 2. Management Alternatives

#### a. Mechanical and/or chemical removal of woody species

Areas 5 and 6 both contain trees, saplings, and shrubs which are present at various densities. These can be removed by two techniques:

- 1) Cut the stems at the base and remove the debris. For some species one cut may be sufficient for removal. For the majority, however, more treatments will probably be necessary. These may include repeated cuttings of sprouts, perhaps even over a period of several years or the application of the safest effective herbicide to the stumps after the initial cut. The cut and herbicide or repeated cuts approaches are labor intensive but have the advantage of being able to be accomplished with minimal destruction of the existing groundlayer.
- 2) Bulldoze the entire area and remove the woody debris either by burying it on site or by off-site disposal. This technique is fast and effective. It works best on areas with minimal slopes. As bulldozing greatly disrupts the existing groundlayer, it can be used only on sites which do not contain many desirable species.

b. Mowing and/or burning

- 1) Periodic mowing of the fields can retard the growth of woody materials and therefore maintain the openings. This technique is only practical in areas in which the woody stems are relatively small in both height and diameter.
- 2) Periodic burning can also damage woody material, and if the burning is timed to occur when cool-season exotic species are active and warm-season natives are dormant (e.g., early spring), this technique can also be used to favor prairie when appropriate species are present.

c. Cultivation

The openings may be maintained by various agronomic practices which are similar to those which presumably created the areas historically:

- 1) Use the areas for crops (corn-oats-hay) or for pasture. This technique maintains openness and can generate a small amount of income.

- 2) Periodically plow and/or disc the openings with or without the planting of a cover crop. If done on a three-to-five year basis, the site will remain relatively open. The use of a cover crop will help retard the invasion of shrubs and trees, which if they are in close proximity, may seed in relatively quickly.

- d. Prairie restoration

Prairies and savannas are the native plant communities that provide open, relatively treeless cover. Several remnant prairie species already exist in Areas 5 and 6. Restoration of a more complete prairie community can enhance the aesthetic experience of visitors to the site as well as provide them with an opportunity to become acquainted with another example of presettlement vegetation. Once established, prairies should be managed by periodic burning and/or mowing to suppress shrub and tree invasion. Two basic alternatives are as follows:

- 1) On sites which already contain a substantial number of prairie species, it is often of interest to prepare the ground in such a way as to be able to introduce seeds and/or plants while at the same time saving all or part of the existing vegetation. One such approach involves removing woody materials by some combination of mowing and/or cutting (with or without the subsequent use of herbicides on the stumps), burning the herbaceous cover, and then lightly scarifying the soil with a disc or any other implement which only disturbs the soil surface and therefore does not greatly disrupt existing prairie species. Seeds and/or plants are then introduced into the scarified soil.
- 2) On sites which contain no desired vegetation a more complete ground preparation can be accomplished. This technique involves killing the existing ground cover chemically (i.e., using the herbicide "Roundup").

after growth begins in the spring), plowing and/or discing the soil, and then planting with seed and/or seedlings.

The species used with either restoration technique should be compatible with those already found on site or in the immediate vicinity of the Monument. The seed should be obtained from remnants within 30 miles (48 Km) of the site so as to help insure survival.

### 3. Strategy of Choice

#### a. Area 5 (South Unit Prairie Remnant)

Because there are already prairie species present, this site provides a logical opportunity for prairie restoration. The program should be geared toward preserving the species already present, and reintroducing those which are characteristic of dry-mesic sites in northeastern Iowa, but which are either absent or present in less than characteristic abundance (Alternative d-1).

Specifically, a sequential procedure for maintaining and enriching the site includes the following:

- 1) Clear a ten foot wide path around the periphery of the prairie opening, cutting woody material and mowing herbaceous material. This may be done in the winter (January-April) of Year 1. The path will serve as a firebreak.
- 2) April, Year 1. Burn the prairie opening, after the emergence of cool-season species (e.g., Bromus inermis) but before growth starts in warm-season species (e.g., Sorghastrum nutans). The burn should be done on a dry day with a slight wind, burning into the wind from the firebreak on the "downwind" side of the area.

- 3) Summer/Fall of Year 1. Remove woody material from prairie opening. Cut trees and shrubs killed in the spring burn and remove. Cut surviving and/or re-sprouting woody materials near the ground and paint the stumps with a 1:5 Roundup:water solution. Also collect seed of prairie species on the Effigy Mounds site and nearby prairie remnants.
- 4) April, Year 2. Repeat the burning procedure of previous year. After the burn, lightly disc all or part of the site (not deeply enough to disturb the roots of prairie perennials). Hand broadcast prairie seed over the disced area at a rate of 3-5 lbs/acre to enrich the species composition.
- 5) Summer/Fall of Year 2. Continue the program of removing woody materials by cutting and painting the stumps with the Roundup solution.
- 6) Subsequent Years. Continue steps 3 and 4 until the entire opening has been planted. Continue to burn on an irregular schedule and remove woody species as necessary.

b. Area 6 (North Unit Old Field)

The north end of the North Unit Old Field is rapidly closing in with woody species. The west side of this portion of the area remains open and can easily be managed by periodic mowing or burning (Alternative b). The east side of the north end is also closing in with woody plants and could be opened up with a good deal of effort. Such effort might better be spent on other portions of the site, however, as this portion of the site is visible neither from the hiking trail to the east nor from Smoky Hollow Road to the west.

The south half of Area 6 is open and should remain so. It is visible from the hiking trail. The sudden change from closed canopy forest to an open panoramic view and rolling topography is dramatic and should be maintained. Although Alternatives a, b, and c would be appropriate for maintaining the

existing opening, we recommend that a "complete prairie restoration" be attempted (Alternative d-2). Many visitors use this area (more than visit the South Unit for example); therefore a prairie in this location could be important in meeting the educational and aesthetic goals for the Monument (Goals 3 and 4 above).

Assuming that the prairie restoration is acceptable, we will address plans for its implementation in detail. Greg Moore is interested in working on it as is Evelyn Howell. Of immediate interest is preparing a species list for the area and making plans for collecting seed.

#### 6. Report Summary

We have identified and mapped seven major plant communities at Effigy Mounds National Monument. These include five woodlands: 1. The Sny Magill Bottomlands, (Area 1), 2. The North End (Area 2), and 3. The South End (Area 3) of the North Unit Oak-Maple Woods, 4. The South Unit Oak-Maple Woods (Area 4), and 5. The North Unit Aspen Woods (Area 7). There are also two open communities: the South Unit Prairie Remnant (Area 5), and the North Unit Old Field (Area 6).

Each community has been sampled at least twice using both qualitative and quantitative techniques. Using these data we have determined that the major woodland communities are good quality representatives of dry-mesic and wet-mesic (Sny Magill) forests. We recommend that these sites be left substantially alone in the near future given a continuation of current use-levels. The areas have few problems with invasive exotics and harbor some interesting species, several of which may be threatened or endangered. One exception to this management approach might be to cut portions of the Aspen Woods (Area 7) to help regenerate aspen and thus to maintain some site diversity.

The open communities (Areas 5 and 6) are dominated by Eurasian grasses with pockets of native prairie species (especially in Area 5). Neither area can be considered representative of a good quality native community, but their open characters are important to the experience of the site. We recommend that active management be used to keep woody materials from dominating these areas. Our preferred techniques include different approaches to prairie restoration.

All of the major plant communities should be monitored at regular intervals in order to keep track of any changes that may occur with time. Of particular importance in this regard are the rare woodland understory species. Their populations need to be estimated periodically in order to determine whether they are increasing or decreasing or are relatively stable. It is also important to check for invasive exotics so that they can be eliminated quickly should they appear.

The management of the vegetation on the effigy mounds themselves appears to be a subject of some controversy. We recommend that several approaches be used including: 1. a continuation of the current policy of keeping at least some of them covered with mown lawn, 2. an experiment to determine how well Antennaria neglecta (pussy toes) would work as a ground cover, and 3. the provision of a tree canopy to cover the mounds such that herbaceous woodland understory plants (but not trees or saplings) would grow on them.

The trail systems throughout the Monument appear to be well maintained. There are a few instances, especially on the switch-backs, in which people are creating problems by leaving the trails and going directly up or downslope. We recommend that the Monument continue some of the measures they have already started to try to prevent this practice. These have included positive interpretation, law enforcement, and the use of snags and rocks to block

access. Another technique which might be emphasized is to create an "edge" to the sides of the paths, either by using very low fences or built-up earthen borders which could serve as "psychological" barriers such that people would not leave the trail.

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A vegetation Survey of  
EFMO,

Evelyn A. Howell

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APPENDIX

All Species Identified by the Vegetation Survey  
Compiled 1982, 1983

<u>Acalypha rhomboidea</u>	Three-Seeded Mercury
<u>Acer negundo</u>	Box Elder
<u>Acer rubrum</u>	Red Maple
<u>Acer saccharinum</u>	Silver Maple
<u>Acer saccharum</u>	Sugar Maple
<u>Achillea millefolium</u>	Yarrow
<u>Actaea alba</u>	White Baneberry
<u>Actaea rubra</u>	Red Baneberry
<u>Adiantum pedatum</u>	Maidenhair Fern
<u>Agrimonia gryposepala</u>	Agrimony
<u>Agropyron repens</u>	Quack Grass
<u>Allium tricoccum</u>	Wild Leek
<u>Ambrosia artemisiifolia</u>	Common Ragweed
<u>Amorpha canescens</u>	Leadplant
<u>Amphicarpa bracteata</u>	Hog Peanut
<u>Andropogon gerardi</u>	Big Bluestem
<u>Andropogon scoparius</u>	Little Bluestem
<u>Anemone cylindrica</u>	Thimbleweed
<u>Anemone quinquefolia</u>	Wood Anemone
<u>Anemonella thalictroides</u>	Rue Anemone
<u>Antennaria neglecta</u>	Pusseytoes
<u>Apocynum androsaemifolium</u>	Spreading Dogbane
<u>Aquilegia canadensis</u>	Columbine
<u>Arabis canadensis</u>	Sickle Pod
<u>Aralia nudicaulis</u>	Wild Sarsaparilla
<u>Aralia racemosa</u>	Spikenard
<u>Arisaema triphyllum</u>	Jack-in-the-Pulpit
<u>Asarum canadense</u>	Wild Ginger
<u>Asclepias syriaca</u>	Common Milkweed
<u>Asclepias verticillata</u>	Whorled Milkweed
<u>Aster drummondii</u>	
<u>Aster ericoides</u>	Heath Aster
<u>Aster laevis</u>	Smooth Blue Aster
<u>Aster lateriflorus</u>	Side-Flowering Aster
<u>Aster novae-angliae</u>	New England Aster
<u>Aster simplex</u>	Panicled Aster
<u>Athyrium filix-femina</u>	Lady Fern
<u>Betula nigra</u>	River Birch
<u>Betula papyrifera</u>	Paper Birch
<u>Bidens cernua</u>	Nodding Bur Marigold
<u>Boehmeria cylindrica</u>	False Nettle
<u>Botrychium virginianum</u>	Rattlesnake Fern
<u>Bouteloua hirsuta</u>	Hairy Grama
<u>Bromus inermis</u>	Smooth Brome
<u>Campanula americana</u>	Tall Bellflower
<u>Camptosorus rhizophyllus</u>	Walking Fern

Carex mühlenbergii  
Carex pennsylvanica  
Carpinus caroliniana  
Carya cordiformis  
Carya ovata  
Caulophyllum thalictroides  
Ceanothus americanus  
Celastrus scandens  
Celtis occidentalis  
Cephalanthus occidentalis  
Chenopodium album  
Circaea quadrisulcata  
Cirsium discolor  
Convolvulus sepium  
Cornus alternifolia  
Cornus racemosa  
Cornus rugosa  
Corylus americana  
Crataegus sp.  
Cryptotaenia canadensis  
Cystopteris bulbifera

Daucus carota  
Decodon verticillatus  
Desmodium glabellum  
Desmodium glutinosum  
Desmodium illinoense  
Desmodium nudiflorum  
Dicentra cucullaria  
Dioscorea villosa  
Dirca palustris  
Dryopteris spinulosa

Echinochloa crusgalli  
Elymus canadensis  
Equisetum arvense  
Erigeron annuus  
Eupatorium purpureum  
Eupatorium rugosum  
Euphorbia corollata

Fagopyrum esculentum  
Fragaria virginiana  
Fraxinus americana  
Fraxinus nigra  
Fraxinus pennsylvanica  
Fraxinus pennsylvanica var lanceolata

Galium aparine  
Galium asprellum (?)  
Galium boreale  
Galium triflorum  
Gentiana saponaria

Sand Sedge  
 Pennsylvania Sedge  
 Blue Beech  
 Bitternut Hickory  
 Shagbark Hickory  
 Blue Cohosh  
 New Jersey Tea  
 Bittersweet  
 Hackberry  
 Buttonbush  
 Lamb's Quarters  
 Enchanter's Nightshade  
 Pasture Thistle  
 Hedge Bindweed  
 Pagoda Dogwood  
 Gray Dogwood  
 Round-Leaved Dogwood  
 Hazelnut  
 Hawthorn  
 Honewort  
Bulblet Fern

Queen Anne's Lace  
 Swamp Loosestrife

Tick Trefoil  
 Illinois Tick Trefoil  
 Bare-Stemmed Tick Trefoil  
 Dutchman's Breeches  
 Wild Yam  
 Leatherwood  
 Shield Fern

Barnyard Grass  
 Canada Wild Rye  
 Horsetail  
 Annual Fleabane  
 Purple Joe Pye Weed  
 White Snake Root  
 Flowering Spurge

Buckwheat  
 Wild Strawberry  
 White Ash  
 Black Ash  
 Red Ash

Green Ash

Cleavers  
 Rough Bedstraw  
 Northern Bedstraw  
 Sweet-Scented Bedstraw  
 Soapwort Gentian

Geranium maculatum  
Geum canadense  
Gleditsia triacanthos

Wild Geranium  
 White Avens  
 Honey Locust

Helenium autumnale  
Helianthus giganteus  
Helianthus strumosus  
Hepatica acutiloba  
Heuchera richardsonii  
Hydrastis canadensis  
Hydrophyllum virginianum  
Hypericum perforatum  
Hystrix patula

Sneezeweed  
 Tall Sunflower  
 Pale-Leaved Sunflower  
 Sharp-Lobed Hepatica  
 Prairie Alum Root  
 Golden Seal  
 Virginia Waterleaf  
 Common St. John's Wort  
 Bottlebrush Grass

Impatiens biflora  
Isopyrum bitermum

Jewelweed  
 False Rue Anemone

Juglans cinerea  
Juglans nigra  
Juniperus virginiana

Butternut  
 Black Walnut  
 Red Cedar

Lactuca floridana  
Lactuca scariola  
Laportea canadensis  
Leersia oryzoides  
Leonurus cardiaca  
Lespedeza capitata  
Liatris aspera  
Lobelia cardinalis  
Lobelia siphilitica  
Lysimachia ciliata

Blue Lettuce  
 Prickly lettuce  
 Wood Nettle  
 Rice Cut Grass  
 Motherwort  
 Round-Headed Bush Clover  
 Rough Blazing Star  
 Cardinal Flower  
 Great Blue Lobelia  
 Fringed Loosestrife

Menispermum canadense  
Mitella diphylla  
Monarda fistulosa

Moonseed  
 Bishop's Cap  
 Wild Bergamot

Oenothera biennis  
Orchis spectabilis  
Oryzopsis racemosa  
Osmorhiza claytoni  
Osmunda claytoniana  
Ostrya virginiana  
Oxalis stricta

Common Evening Primrose  
 Showy Orchis  
 Black-Seeded Rice Grass  
 Sweet Cicely  
 Interrupted Fern  
 Ironwood  
 Wood Sorrel

Panicum dichotomiflorum  
Parthenocissus quinquefolia  
Pedicularis canadensis  
Pellaea glabella  
Phleum pratense  
Phlox divaricata  
Phryma leptostachya  
Physalis heterophylla  
Physalis pubescens  
Plantago major

Knee Grass  
 Virginia Creeper  
 Wood Betony  
 Cliff Brake  
 Timothy  
 Woods Phlox  
 Lopseed  
 Ground Cherry  
 Hairy Ground Cherry  
 Common Plantain

Poa pratensis  
Podophyllum peltatum  
Polemonium reptans  
Polygonum sp.  
Populus deltoides  
Populus grandidentata  
Populus tremuloides  
Potentilla simplex  
Prenanthes alba  
Prunella vulgaris  
Prunus serotina  
Prunus virginiana  
Pteridium aquilinum  
Pycnanthemum virginianum

Quercus alba  
Quercus bicolor  
Quercus borealis  
Quercus muhlenbergii

Ranunculus abortivus  
Ranunculus septentrionalis  
Ratibida pinnata  
Rhus radicans  
Rhus typhina  
Ribes cynosbati  
Ribes missouriense  
Robinia pseudacacia  
Rosa sp.  
Rubus allegheniensis  
Rubus strigosus  
Rudbeckia hirta  
Rumex crispus

Sagittaria latifolia  
Salix interior  
Sambucus canadensis  
Sanguinaria canadensis  
Sanicula gregaria  
Scrophularia marilandica  
Scutellaria sp.  
Sicyos angulatus  
Smilacina racemosa  
Smilacina stellata  
Smilax lasioneura  
Solidago canadensis  
Solidago flexicaulis  
Solidago nemoralis  
Solidago rigida  
Solidago speciosa  
Solidago ulmifolia  
Sorghastrum nutans  
Sporobolus cryptandrus  
Sporobolus heterolepis  
Staphylea trifolia

Kentucky Blue Grass  
 Mayapple  
 Jacob's Ladder  
 Smartweed  
 Cottonwood  
 Big-Toothed Aspen  
 Trembling Aspen  
 Common Cinquefoil  
 Lion's Foot  
 Self-Heal  
 Black Cherry  
 Choke Cherry  
 Bracken Fern  
 Mountain Mint

White Oak  
 Swamp White Oak  
 Red Oak  
 Chinquapin Oak

Aborted Buttercup  
 Swamp Buttercup  
 Yellow Coneflower  
 Poison Ivy  
 Staghorn Sumac  
 Pasture Gooseberry  
 Wild Gooseberry  
 Black Locust  
 Wild Rose  
 Wild Blackberry  
 Red Raspberry  
 Black-Eyed Susan  
 Curly Dock

Common Arrowhead  
 Sandbar Willow  
 Elderberry  
 Bloodroot  
 Black Snakeroot  
 Figwort  
 Skullcap  
 Bur Cucumber  
 False Solomon's Seal  
 Starry False Solomon's Seal  
 Common Carrion Flower  
 Common Goldenrod  
 Zig-Zag Goldenrod  
 Old-Field Goldenrod  
 Stiff Goldenrod  
 Showy Goldenrod  
 Elm-Leaved Goldenrod  
 Indian Grass  
 Sand Dropseed  
 Prairie Dropseed  
 Bladdernut



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## Memorandum

To: Superintendent, Effigy Mounds

From: Chief, Programs and Budget, Midwest Region

Subject: Concurrent review of document: A Vegetation Survey of Effigy Mounds NM

The document described on the enclosed Midwest Regional Office Review Notice is on concurrent review by this Office until ~~July 25~~. All comments should be submitted by this date for consideration prior to the Regional Director's decision.

*Aug 1*

*Catherine G. Dawson*

Enclosures 2

117  
Review Log No.

July 11, 1984  
Issue Date

July 11, 1984  
Issue Date

Deputy Regional Director  
Associate Regional Director, Planning and Resource Preservation  
Chief, Division of Planning and Environmental Quality  
Associate Regional Director, Operations  
Associate Regional Director, Administration  
Special Assistant to the Regional Director, Cooperative Activities  
Assistant to the Regional Director, Public Affairs  
Chief, Contracting and Property Management  
Public Health Coordinator  
Chief, Midwest Archeological Center, w/cy enc.

Subject: Notice to Review  
A Vegetation Survey of Effigy Mounds NM

Please return this notice  
to the Programs Office by:

DUE DATE: July 25, 1984

The subject document:

X is in the Programs Review Room for your critical review, comments, and recommendations.

is enclosed for your critical review, comments, and recommendations.

This survey was submitted by the Research and Science for review and comments. All comments will be forwarded, verbatim, to them for final disposition.

Concurrent review sent to park.

*Calline & Damon*

Chief, Programs and Budget

**Review Acknowledgement:**

The appropriate divisions and/or disciplines have reviewed the subject document and submit the indicated response.

Comments enclosed

No comment

Signature

Date \_\_\_\_\_